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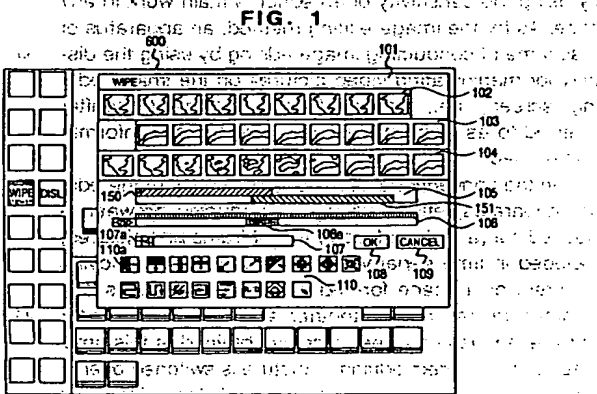
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(54) Method for editing image information with aid of computer and editing system

(57) There is provided an editing method and an editing system for conducting editing processing on a video information material containing sound information and moving picture information with the aid of a computer. Information of the video information material is stored in a storage device (506). The video information is read out from the storage device (506). The read out video information (102, 103, 104, 121, 122, 126, 607, 934) is displayed on the screen of a display device. An editing position of the video information is displayed on the video information of the screen according to a command from a user. Upon a command from the user, the editing position (106, 107, 129, 130, 131, 132, 905) is altered. Editing processing (110, 610, 611, 1305) specified by the user is conducted on video information located in the displayed editing position. And edited video information (104, 106, 934) is displayed on the screen.



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## Description

## BACKGROUND OF THE INVENTION

The present invention relates to editing processing of moving images, such as video pictures and sounds, and in particular to an image editing method and an image editing apparatus suitable for creation of television broadcast programs and video programs, and to a medium having a program recorded thereon to make a computer execute image editing processing operation. In recent years, methods for creating tele

vision broadcast programs and video programs, enhanced by using computers have been rapidly advanced. Instead of video editing techniques of using a video tape recorder and repeating the fast feed and rewinding operation, editing is conducted by using images stored in a hard disk which is inexpensive and easy to handle and preserve. Moving image editing apparatuses using such techniques of so-called direct scheme have recently attracted attention.

In JP-A-4-207877, there is disclosed a moving image managing apparatus for displaying moving images on a screen in a hierarchical structure of a tree form including cuts and scenes and conducting editing by taking a scene or a cut as the unit.

Herein, the term "moving image" means image information which contains pictures (of a plurality of frame units or sound information or both of them arranged respectively independently in time series and which can be displayed as moving images.

As for the image editing work, work to be decided by using the sensitivity of an editor is main work in any case. As for the image editing method, an apparatus of a scheme of conducting image editing by using the display for manipulating video pictures on the image editing screen, i.e., so-called icon display (hereafter referred to as icon) in association with image information is used.

In the conventional technique of such a image editing apparatus, effect editing is conducted between a desired cut (a series of a plurality of frame unit pictures) included in time serial video picture materials (moving pictures) or a scene formed by a plurality of cuts and another desired cut or another scene. FIGS. 2 and 3 show examples of screen display obtained at this time. That is, in the effect editing, a picture is switched over to another one while the contents of the picture is changed.

First of all, FIG. 2 shows an example of display of a screen for the computer aided editing work. FIG. 3 is a different example of display of a screen for the computer aided editing work. Both of these editing works use representative software for picture editing which is commercially available.

The general configuration of the editing apparatus used at this time is a system based upon a computer. To be more concrete, it is a typical and general-purpose

configuration having a central processing unit, a memory and various devices operated by an operator.

FIG. 4 shows an example of an image editing system. The image editing system has a computer 401. To the computer 401, a monitor 407 including a display screen having a size of, for example, 19 inches is connected.

A video reproduction unit (VTR) 402 can reproduce any video information (image information) of the NTSC system, PAL system, or any other format system. The video information reproduced by this video reproduction unit 402 is sent to a video capture/ frame storage unit 403, and converted into digital information and stored therein.

The video information thus stored in the video capture/ frame storage unit 403 is then supplied to a disk accelerator 405 via an expander/compressor 404.

This expander/compressor 404 functions to compress and expand video information. An expander/compressing processor using JPEG (Joint Photographic coding Experts Group) chip having the highest rate at the present time is often used.

The disk accelerator 405 functions to transmit the video information sent from the video reproduction unit 402 to the video capture/ frame storage unit 403 and stored therein to at least one disk storage unit 406, or functions to receive information therefrom.

By using control signals 408, 409 and 410, the computer 401 controls components of the image editing apparatus, i.e., the video capture/ frame storage unit 403, the expander/compressor 404, and the disk accelerator 405.

For the purpose of the editing work and other works to be then executed, the video information stored in the disk storage unit 406 can be read out from the disk storage unit 406, and read into the video capture/ frame storage unit 403 via the disk accelerator 405 and the expander/compressor 404 by using the control signals 408, 409 and 410 supplied from the computer 401.

In accessing desired video information, the apparatus shown in FIG. 4 has a feature in that it can "immediately" access (i.e., randomly access) the video information unlike the conventional sequential file apparatus needing the rewinding operation of the video tape in principle. As described above, therefore, the technique of the direct scheme is used.

The aforementioned FIGS. 2 and 3 show first and second examples of a screen for the editing work displayed on the monitor 407, respectively. In FIGS. 2 and 3, vertical lines denoted by numerals 210 and 313 are figures for indicating the reference position at the time of editing work, and they are called current position bars.

Numerals 302 and 303 on the screen of FIG. 3 denote time lines for relatively indicating the position and the range of a cut or a scene to be edited on the basis of the position of the above described current position bar. For each picture information (image information) to which the cut or scene to be edited belongs,

a track for time-line display is assigned and a corresponding track name is provided.

On the screen of FIG. 2, numeral 203 denotes a time line for relatively indicating the position and the range of a cut or a scene after the editing. On the screen of FIG. 3, numeral 304 denotes a time line indicating the range of synthesis when pictures of the two time lines 302 and 303 are combined and edited.

Each of numerals 201 (FIG. 2) and 301 (FIG. 3) denotes a time-line window. On the window, the above-described time line is displayed. The time lines 203, 302 and 303 can be moved in a scroll manner by screen manipulation.

Numeral 205 denotes a program window. In order to confirm a scene of the image (picture) of the time line 203 displayed in the time-line window 201, its image is displayed in the program window 205 according to image information (video information) read out from the disk storage unit 406. A group of buttons for directing mark-in and mark-out positions which are reproduction start and reproduction stop positions of the image displayed with a mouse (not illustrated) which is a direction device connected to the computer 401 of FIG. 4 are also displayed.

Numerals 206 and 306 denote windows called working bin window or project window for displaying video information (image information) stored in the disk storage unit 406, mainly edited image information.

For conducting effect editing, a window 305 for displaying a list of various video effect patterns and an effect setting window 312 for setting the kind of the effect or the effect quantity, or a video effect panel window 207 having the functions of these two windows together are provided.

The effect editing is editing for conducting special effect processing such as a wipe effect or a dissolve effect on an image. In the process of transition from a picture A to a picture B, the wipe effect is image processing (picture processing) of eliminating the picture A from the screen in a certain changing pattern as if it wipes off the picture A and instead causing a different picture B to appear in an area from which the picture A has been eliminated. In the process of transition from a picture A to a picture B, the dissolve effect is picture processing of causing a picture B to gradually appear while causing the luminance of the picture A to gradually fall and disappear. In the effect editing, other special effect processings other than the wipe effect and the dissolve effect may be also included.

Operation required for the effect editing will now be described in more detail by referring to FIGS. 2 and 3.

(Case of FIG. 2)

For each scene or cut displayed on the working bin window 206, two out of different video materials are first selected by manipulation of the mouse and arranged on the time line 203 in the order of coupling.

Subsequently, the bar 210 is moved to the position of the coupling of the two video materials by the mouse.

As a result, the effect editing is started in the position of the moved bar 210.

In other words, editing work desired by the user is conducted by manipulating a menu bar 208 for selecting an effect kind, a window 209 in which an effect time can be set by means of a numerical input from a keyboard.

(not illustrated) connected to the computer 401 in the same way as the mouse, and sliders allowing the user to set other values, such as the width of the boundary of the vertical wipe in the scene transition from the left to the right or the gradation quantity.

At this time, a plurality of still pictures 202 after editing to confirm a scene of the image (picture) of the time line 203 are arranged and displayed on the time line window 201. At predetermined frame intervals, the state of the effect of the edited scene is read out from the disk storage unit 406.

As for the number of frame in the predetermined frame intervals, variable setting is possible. This setting is conducted by selecting a predetermined menu from a menu bar included in the program window 205.

(Case of FIG. 3)

From video materials differing in scene or cut displayed in the project window 306, two video materials are selected and disposed on the time lines 302 and 303 as role A and role B, respectively.

In the case where two scenes or cuts are subject to editing, the terms "roll A" and "roll B" are used to make a distinction between them. The synthetic editing in this case is also referred to as "AB role editing".

In order to set the effect time, the time line 303 is then moved by the mouse so as to attain a predetermined overlap width with respect to the time line 302 in the direction of the axis (time axis) of abscissas.

If any one pattern is selected by the user out of various effect patterns displayed in the video effect pattern display window 305, then the effect setting window 312 is displayed, and an effect pattern symbol is displayed in the range of the above described overlap on the time line 304.

On the effect setting window 312, the user inputs or varies the effect setting quantity, and conducts the desired editing work.

At this time, still pictures before editing are displayed respectively on the time lines 302 and 303 in the time line window 301 at predetermined frame intervals.

This setting of the number of frame intervals is conducted in a slider 315.

In the editing system described by referring to FIGS. 2, 3 and 4, it cannot be said that sufficient consideration is not given to the display required for the image editing, and in particular to its kind selection. The image editing work cannot be simplified. The editing system has problems in making effective image editing possible.

In other words, first in the example of FIG. 2, the editing work is conducted by the numerical input from the keyboard while the operator is confirming the contents of the edited effects by means of the still pictures 202 displayed at the predetermined frame intervals. At this time, however, simultaneous display of pictures corresponding to the roles A and B which is effective in facilitating the AB role editing is not conducted. Therefore, the operator cannot determine the start point and end point of a scene transition at the time of scene synthesis while confirming the images obtained before editing.

Subsequently, in the example of FIG. 3, video materials of different scenes displayed in the project window 306 are, respectively, selected and moved onto the time lines 302 and 303. The editing work is, thus, conducted while displaying the pictures of the roles A and B. Therefore, the problems offered in the case of FIG. 2 are not posed. Unlike FIG. 2, however, there is no display corresponding to the still picture display 202 or 203 after the effect editing. Therefore, the user cannot confirm the scene transition state obtained when the effect editing has been conducted.

In the above described two examples, therefore, the start points and end points of the scene transitions of the role A and role B to be edited are confirmed by the picture display or by observing the picture of the role AB resulting from the synthetic editing. Thus, there remain problems that they cannot be confirmed quickly by the picture display of the time line window alone and displays must be switched over.

In general, moving image are accompanied by sound information. In this case, editing on sounds also becomes necessary. Editing modes of sounds at this time are roughly classified into the following two kinds.

A first mode is the so-called overlap editing. When splicing a certain scene of a video picture B to a certain scene of a video picture A, sound A is gradually attenuated in the splicing place and sound B is gradually augmented. These states are overlapped.

This overlap editing is used for the purpose of preventing the unnaturalness caused by a sudden change of sound at the splicing point and making a smooth transition between scenes possible.

A second mode is the so-called mixing editing. Apart from sounds accompanying the video images, new sounds are added to the video images in the mixing editing.

This mixing editing is used when BGM (background music) or the like is desired to be accompanied with video pictures.

According to the method which has become the mainstream in conventional broadcast program production sites when conducting such editing, two VTRs are prepared and reproduction outputs of them are inputted to a mixer. While listening to the reproduced sound, the editor manipulates the mixer. While the editor is determining the degree of attenuation and the degree of aug-

mentation of each sound during the reproduction, the editing is conducted.

The above described conventional techniques have problems that sufficient consideration is not given to facilitating the editing work and the editing work requires high skill and a great deal of labor and time.

In the editing according to the conventional technique as described above, two VTRs are prepared and reproduced outputs of them are inputted to the mixer. The editor must manipulate the mixer and determine the degree of attenuation and the degree of augmentation during the reproduction while listening to the sounds. Therefore, high skill is required for the work. In addition, in the case where modification or alteration of editing is to be conducted, it is necessary to rewind a VTR once more.

A great deal of labor and time are required. In the so-called nonlinear editing heretofore used, however, the editing mode using the time line scheme forms the mainstream.

According to this scheme, editing is advanced by inserting materials of the video picture and sound with mouse manipulation in a window of strip-like display with the time axis direction replaced by the horizontal direction of the display screen.

In this time line scheme as well, however, both the video picture and sound are displayed by only strips having lengths according to the time lengths, respectively. This results in a problem that conducting the work of determining the edit point in the overlap editing and determining the mixing start point in the mixing editing is difficult.

Examples of the computer aided video and audio editing systems are disclosed in the user's guide manuals of Adobe Premiere version 4.0 (Adobe Systems Incorporated, 1994) and MEDIA SUITE PRO Version 1.0 (Avid Technology, Inc., 1994).

## SUMMARY OF THE INVENTION

The present invention provides an editing method and an editing system capable of conducting the effect editing of images that like pictures or the sound or the both of them simply and rapidly by manipulation on a computer graphical user interface screen, and provides a recording medium storing a program for executing the editing processing.

The present invention provides an editing method and an editing system for conducting editing processing on an image information material containing sound information and moving picture information with the aid of a computer.

In the editing method and the editing system according to the present invention, information of the image information material is stored in a storage device. The image information is read out from the storage device. The read out image information is displayed on the screen of a display device. An editing position of the

image information) is displayed on the display of the image information. If the screen according to a command from a user. Upon a command from the user, the editing position is altered. Editing processing specified by the user is conducted on image information located in the displayed editing position. And edited image information is displayed on the screen.

Therefore, the user can conduct editing processing while confirming both the editing material and the editing result simultaneously on the screen.

According to an embodiment of the present invention, editing of the moving picture information and/or the sound information can be conducted on the screen of the display device. According to another embodiment of the present invention, the display of relating sound information is altered so as to be linked with the editing of the moving picture information. According to a different embodiment, reduced (contracted) moving picture information are created by reducing pixels of the moving picture information, and the contracted moving pictures are thus created are stored in the storage device. From the contracted moving picture information read out from the storage device, contracted moving pictures of a film image are created. The moving pictures of the film image thus created are displayed on the screen as the editing material.

**BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is a diagram showing an example of an effect editing screen display according to an embodiment of the present invention;

FIG. 2 is a diagram showing an example of a screen display of effect editing;

FIG. 3 is a diagram showing another example of a screen display of effect editing;

FIG. 4 is a block configuration diagram showing an example of a moving image editing apparatus;

FIG. 5 is a block configuration diagram of a moving image editing apparatus according to the present invention;

FIG. 6 is a diagram showing an example of a tree structure image on a display screen according to an embodiment of the present invention;

FIG. 7 is a data configuration diagram of a picture information file in an embodiment of the present invention;

FIG. 8 is a data configuration diagram of a hierarchical structure management information file in an embodiment of the present invention;

FIG. 9 is a flowchart of a program for controlling effect editing in an embodiment of the present invention;

FIG. 10 is a diagram showing an example of a hierarchical structure image of picture information using a combination of representative pictures in an embodiment of the present invention;

FIG. 11 is a diagram showing another example of a hierarchical structure image of picture information using a combination of representative pictures in an embodiment of the present invention;

FIG. 12 is a diagram showing a display state before a transition to an effect editing screen display in an embodiment of the present invention;

FIG. 13 is a block diagram showing an example of a moving image editing apparatus used in an embodiment of the present invention;

FIG. 14 is a schematic diagram of a display screen before a display for editing in an embodiment of the present invention;

FIG. 15 is a diagram showing operation conducted by a moving image editing apparatus used in an embodiment of the present invention;

FIG. 16 is a schematic diagram showing an example of an editing screen display according to an embodiment of the present invention;

FIGS. 17A and 17B are examples of an editing screen display according to an embodiment of the present invention;

FIG. 18 is a diagram for explaining overlap sound editing in an embodiment of the present invention;

FIG. 19 is a schematic diagram of a display screen after overlap sound editing in an embodiment of the present invention;

FIG. 20 is a schematic diagram of a reproduction display screen for confirming the editing state in an embodiment of the present invention;

FIG. 21 is a schematic diagram showing another example of an editing screen display according to an embodiment of the present invention;

FIG. 22 is a diagram for explaining overlap sound editing in the case where a special effect such as a wipe or dissolve has been applied to video pictures;

FIG. 23 is a diagram for explaining overlap sound editing in the case where a special effect such as a wipe or dissolve has been applied to video pictures;

FIG. 24 is a schematic diagram showing another example of an editing screen display according to an embodiment of the present invention;

FIG. 25 is a diagram for explaining the operation of sound mixing editing in an embodiment of the present invention;

FIG. 26 is a schematic diagram of a display screen after sound mixing editing in an embodiment of the present invention;

FIG. 27 is a flow chart showing the procedure of the overlap editing shown in FIGS. 17A and 17B;

FIG. 28 is a flow chart showing the procedure of wipe editing shown in FIG. 21;

FIG. 29 is a flow chart showing the procedure of mixing editing shown in FIG. 24.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereafter, an image editing apparatus according to the present invention will be described in more detail by referring to illustrated embodiments.

FIG. 5 shows an example of a hardware configuration in an embodiment of the present invention. The hardware configuration includes a CPU 501 for processing various controls, a monitor 508 for displaying various kinds of information, such as image information of a scene and a cut used for image editing and a hierarchical structure (tree structure) representing the editing state, a memory 502 for storing various control programs of the CPU 501, a storage device such as a magnetic storage device 506 for storing image information, sound information, and editing information relating to the information, a frame buffer memory 507 for storing images to be displayed on the monitor 508, a scene change point detector 503 for detecting a scene change point between cuts, a mouse (or keyboard) 509 serving as an input device, a compressor/expander portion 511 for compressing picture information supplied from a video tape recorder (hereafter referred to as VTR) 505 to generate compressed picture data and expanding compressed picture data to reproduce picture information equivalent to the picture information supplied from the VTR 505.

From the image information stored in the magnetic storage device 506, contracted (reduced) pictures for high speed display obtained from the original image material by reducing the information content, for example, information reduced by 1/64 are generated and stored in the magnetic storage device 506 under the control of the CPU 501.

The CPU 501, the memory 502, the scene change point detector 503, a video interface 504, the magnetic storage device 506, and the frame buffer memory 507 are connected to a bus 510. As a result, respective components are controlled by access from the CPU 501.

In the magnetic storage device 506, the following various kinds of information are stored:

- frame numbers associated with frames in a series of pictures, or frames at change points detected by the cut change point detector 503;
- name of file in which contracted picture data for high speed display have been filed;
- name of file in which compressed picture data have been filed;
- contracted picture data for high speed display;
- compressed picture data;
- hierarchical number representing a hierarchical step number for a plurality of scenes or cuts;
- cut number, serially provided in the order of cuts in a plurality of video image materials;
- sequence number representing the order, in a

scene, of each of a plurality of cuts forming the scene;

(i) identification information representing whether each scene or cut should be displayed in a hierarchical structure when the hierarchical structure is displayed on the monitor 508;

As the magnetic storage device 506, a magnetic disk, an optical disk or a different recording medium such as a magnetic-optical disk storage device may be used, or a remote file made accessible via a communication network (LAN or a network using an RS-232C interface) may be used.

Operation of an embodiment of the present invention thus configured will now be described.

First of all, in response to a command from the mouse (or keyboard) 509, a video signal which is a video image information source is outputted from video tape mounted on the VTR 505. Via the video interface 504 and the bus 510, image information according to the video signal is registered in the magnetic storage device 506.

According to the video signal outputted from the VTR 505 at this time, image information of each frame unit is supplied to the scene change point detector 503. In the scene change point detector 503, the image information is encoded and scene change points in the encoded image information are detected. Information concerning the scene change points is also registered in the magnetic storage device 506.

As a result, image information including a frame number corresponding to a frame of a scene change point of a detected scene change, a contracted picture for high speed display and a file name in which the picture has been filed, and a compressed picture and a file name in which the picture has been filed is stored in the magnetic storage device 506.

In other words, the video signal outputted from the VTR 505 is subjected to data compression in the compressor/expander 511, and the compressed picture data are also registered in the magnetic storage device 506.

The contracted pictures for high speed display are provided so as to be read out at high speed from the magnetic storage device 506 when contents of the whole of moving images formed by a plurality of frames or a scene are to be confirmed or the result of editing is to be confirmed. When the video signal is outputted from the VTR 505, the contracted pictures for high speed display are also generated on the basis of the video signal under the control of the CPU 501 and registered in the magnetic storage device 506.

The "contracted pictures for high speed display" are pictures contracted in picture size and reduced in number of pixels as compared with the original pictures in order to display a large number of cut pictures representative of each scene on the screen of the monitor 508 immediately in response to editing manipulation. In

the editing system of the present invention, both a material picture to be edited and a picture completed in editing are displayed on a single screen substantially in an instant in response to a user's command. For that purpose, the information volume (such as the number of pixels or the number of scanning lines) of the original picture information is thinned out by a predetermined amount. Thus, the information volume is reduced so as to allow high-speed readout from the magnetic storage device 506. In addition, the size of the cut picture is contracted so that the display screen of the monitor may accommodate a required number of cut pictures. In this way, contracted pictures for high-speed display are prepared beforehand. The contracted pictures for high-speed display are produced by the CPU 501 by conducting processing for reducing the information volume of the original picture information of various video systems such as the NTSC system or the PAL system.

When it is desired to confirm the contents of the above described scene, the pictures for high-speed display thus contracted are used to display the desired scene on a high-speed display window 602 shown in FIG. 6 in response to a command using the mouse (or keyboard) 509.

The window display of FIG. 6 is displayed on the screen of the monitor 508 before the effect editing is started according to the embodiment of the present invention is started.

For taking out a predetermined frame picture from picture data subjected to data compression, it is necessary to conduct expansion processing as is generally known. If the compressor/expander is not present as hardware, therefore, it is necessary for the CPU 501 and the compressor/expander 511 to conduct picture processing and effect the compression by using the algorithm of the JPEG system; for example. In the case of data compression/expansion processing using software, a long processing time is needed.

In this embodiment, contracted picture data for high-speed display are recorded in the magnetic storage device 506 beforehand. Even if the compressor/expander for conducting the compression/expansion processing at high speed is not present as hardware, therefore, the contracted picture data for high-speed display can be read out without requiring the processing time for expansion. In other words, expansion processing is unnecessary in the case where the contracted picture for high-speed display are reproduced.

If the operator commands readout of the picture information for high-speed display registered in the magnetic storage device 506 by using the mouse (or keyboard) 509, the CPU 501 reads out only first frames of respective cuts representing scene change points of pictures. On a display screen 600 of the monitor 508, a window 603 for taking a look at cuts as shown in FIG. 6 is thus displayed.

With respect to this display, the operator informs the

CPU whether the scene change point detected by the scene change point detector 503 is proper for the contents of the image and of scene partitions by using the mouse (keyboard) 509.

The CPU 501 provides each of cuts judged to be proper as a scene change point of images stored in the magnetic storage device 506 with a cut number.

If image editing or the like is commanded by the operator via the mouse (or keyboard) 509, tree structure management information as shown in FIGS. 7 and 8 is read out from the magnetic storage device 506 or the memory 502.

FIG. 10 represents frame pictures (frame images) forming moving pictures recorded in the magnetic storage device 506 by using a hierarchical structure. In the system of the present embodiment, this hierarchical structure is displayed on the monitor screen. The term "cut" is defined as a set of frame pictures (frame images) shot by a TV camera from the start of a shoot to the end thereof. A scene is formed by a set of a plurality of cuts obtained by shooting a certain fixed shoot subject. Furthermore, a plurality of scenes can be collected by a specific shoot theme. Video sources can be arranged as a hierarchical structure of recorded video sources. It is now assumed that the shoot theme is, for example, "tropical island". In the recorded video sources, a cut 1 obtained by shooting a fish in the sea around an island, a cut 2 obtained by shooting a coastal landscape, a cut 3 obtained by shooting birds inhabiting a forest, and a cut 4 obtained by shooting a flower are included. The cut 1 is formed by 1st through 90th frames, and the cut 2 is formed by 91st through 150th frames. Video pictures of the cut 1 and the cut 2 are collected as a scene 1 having images of the sea as the shooting subject. The cut 3 and the cut 4 are collected as a scene 2 having images of the forest as the shooting subject.

In the editing apparatus according to an embodiment of the present invention, a representative frame picture included in frames forming each cut and a frame of a representative cut included in cuts forming each scene are displayed on the screen of the above described hierarchical structure as contracted pictures for high-speed display.

In the embodiment of the present invention, editing can be simply conducted by altering the original hierarchical structure displayed on the screen by simple manipulation. For example, it is possible to conduct alteration (editing) so as to generate such a hierarchical structure that the cut 1 and the cut 3 have been altered to a new scene 1 having animals inhabiting the island as the shooting subject. In the editing using the screen of



the hierarchical structure, it is possible to replace or add different cuts. As shown in FIG. 12, the tree structure shown in FIG. 6 is thus displayed in the tree structure display window 601 of the monitor 508.

As for the method and system of moving image editing using the hierarchical structure, those disclosed in co-pending U.S. patent application Serial No. 08/826,975 filed on April 9, 1997 titled "Method of Editing Moving Image and Apparatus of Editing the Same" can be used in the embodiment of the present invention.

For example, in the case where management information corresponding to the tree structure as shown in FIG. 10 has been read out, it is now assumed that a command for causing images of the cut 1 and cut 2 to compose the scene 1 is inputted by the operator. Then, image data having the data structure shown in FIG. 7 and the tree structure management information having the data structure shown in FIG. 8 corresponding to the cut 1 and the cut 2 are read out from the magnetic storage device 506 by the CPU 501. In addition, a picture number serving as a parent in the tree structure management information is set to 1 and values "1" and "2" are set in addresses of cut numbers 1 and 2 serving as "children", respectively. Subsequently, the cut numbers 1 and 2 is respectively searched.

Furthermore, display coordinates where icons of these two cuts are displayed are calculated. The calculated values are set as cut icon display coordinates of FIG. 8 respectively. The tree structure management information is reregistered.

As for a scene 2 as well, tree structure management information is reregistered by similar processing.

In the case where the theme is generally formed by a plurality of scenes including the scene 1 and the scene 2 as shown in FIG. 10, the tree structure management information is read out from the magnetic storage device 506. Values "1" and "2" are registered in the area of the CHILD SCENE NUMBERS 1 and 2. In the area of the PICTURE NUMBER of the management information, the contracted pictures for high speed display of the cut 1 and the cut 2 are displayed in the window 101 shown in FIG. 1 as icon streams (image streams) 102 and 103.

Subsequently, the operator manipulates the mouse (or keyboard) 509 and thereby issues a command that icons other than icons located in the lowest layer should not be displayed in the tree structure display window 601. Upon this command, the hierarchical structure management information is read out from the magnetic storage device 506 or the memory 502. A display identifier indicating that the icons should not be displayed in the tree structure display window 601 is added to predetermined management information, and resultant information is reregistered.

As a result, the CPU 501 discriminates this display identifier, recalculates the display position, and conducts the display on the monitor 508. As for the display at this time, therefore, the cuts 3 and 4 supplied with the display identifiers preventing the display are not displayed as shown in FIG. 11.

By successively repeating this manipulation, therefore, the CPU 501 conducts processing on the basis of the graph are displayed as pseudo-pictures representing



the roll A and the roll B. As pseudo-pictures representing the role A+B synthesized by the dissolve editing, the icon for a horizontal slide wipe effect wherein a picture of a picture stream 104 formed by the film image similar to the role B role slides from the left side over a picture of A role (A framed photograph) is displayed. Thus, the editing work can be thereby, switching over the A role to B role. AJP\_WAIPER of the role A+B can be conducted easily.

Under the icon streams 102, 103 and 104 in the JA window 101, a window 105 is set as an effect time setting area. In the window 105, rectangular figures (slide effect input processing can be selected almost on the picture stream 150 and 151 is selected and moved by the mouse 509. Thus the work can be advanced efficiently. Control processing of the manipulation of the mouse 509 are displayed. The effect time length of these rectangular figures 150 and 151 in the JA window 101 conducted by the CPU 501 will now be described. The window 101 is controlled by using a predetermined program.

Therefore, the effect time setting can be grasped as follows. FIG. 9 is a graphic overlap of these rectangular figures 150 and 151. By referring to a flow chart showing the control processing of the window 105, moving these figures 150 and 151 with the mouse 509, the effect time length of these rectangular figures 150 and 151 is written into the JA window 101. The processing of FIG. 9 is started by selecting an effect time memory 502. As a result, the effect time is set.

A white area of a bar figure 106 in FIG. 1 indicates the overall length (time) of all images forming the cut 1 and the cut 2 selected as the editing subject. A hatched rectangle 106a located at the central part of the bar figure 106 indicates the time length of the connected picture streams 102 and 103 of the cut 1 and cut 2 of the currently displayed region and the temporal position of the displayed image in all of the images. REDRAW\_FLAG is a flag for determining whether display processing of the icon streams 102, 103 and 104 should be conducted.

By manipulating the mouse, the rectangle 106a can be moved. According to the moved position, film images of the place to be confirmed of each scene of the effect time portion are displayed as the icon streams 102, 103 and 104.

The position of the rectangle 106a moved by the mouse 509 at this time is also written into the memory 502. As a result, the film images displayed on the icon streams 102, 103 and 104 are set.

As the setting area for displaying the picture data for high speed display on the film images with an arbitrary reduced scale, i.e., as the setting area for displaying the picture data for high speed display with a fixed frame interval, an icon of a film image icon stream display interval setting slider 107 is set. In the slider 107 as well, a rectangle 107a moved by manipulating the mouse is displayed. At this time, the set numerical value is also displayed simultaneously within the rectangle 107a as illustrated.

In this embodiment, an OK button 108 and a cancel button 109 for icons are set. By manipulating a pointer on the screen with the mouse 509 and selecting the OK button 108, the operator can terminate the editing. By selecting the cancel button 109, the operator can abandon the processing on the way.

Furthermore, in this embodiment, several kinds of wipe patterns and dissolve patterns, and an icon area 110 for displaying other effect video processing by using figures are set. The operator selects a figure (icon) within this area 110 with the mouse 509. Thereby, a synthetic pattern of film images corresponding to the effect video processing indicated by the selected figure (icon)

After such processing has been finished, the step proceeds to "1" and the processing proceeds to step 916. At the step 909 is executed, whereby the variable REDRAW\_FLAG is set to "1".

At the step 909, it is determined whether the variable REDRAW\_FLAG is written into an address of a film image icon stream number. If the variable REDRAW\_FLAG is "1", the scene transition editing processing proceeds to the step 909. If the variable REDRAW\_FLAG is "0", the scene transition editing processing proceeds to the step 906. At step 906, it is determined whether the wipe pattern number, which is inputted by the user and a return to the step 900, is conducted. If the wipe pattern number, which is inputted by the user, has been pressed, the processing proceeds to the step 907. Otherwise, the processing proceeds to the step 917.

When the variable REDRAW\_FLAG is judged to be "1", the step 907 is executed. At the step 917, the variable REDRAW\_FLAG is set to "0". At the step 910, data for special effect window setting is read from the memory 502 and the processing proceeds to step 918. At the step 918, a numerical value specified by the mouse 509 is read and the processing proceeds to step 919. At the step 919, the overlap quantity and the wipe pattern number are read from the memory 502 and the processing proceeds to the step 920. At the step 920, processing for closing the window 101 is conducted. Thereafter, a return to the original display screen is effected, and the effect editing is finished.

Therefore, processing of steps 900 through 910 is repeated until the end of the processing being able to be executed in accordance with displaying of window 101. Individual processing of steps 903 through 908 corresponding to respective events will now be described.

If a decision result at any one of steps 903 through 908 addresses, beginning at the recording address of the film image icon stream number, the hierarchical structure management information file is read from the memory 502 and the processing proceeds to step 920. At step 920, processing for closing the window 101 is conducted. Thereafter, a return to the original display screen is effected, and the effect editing is finished.

Various sliders and buttons displayed on the screen are associated with interrupt events beforehand. At step 903, the result becomes "yes" when the overlap quantity setting slider 105 has been pressed. i.e., the slider 105 has been pointed. Otherwise, the processing proceeds to the step 904.

If the result is "yes", then the variable REDRAW\_FLAG is set to "1" at the step 911 and the processing proceeds to step 912. At the step 912, a numerical value inputted according to the point position specified by the mouse 509 is written in the address of the overlap quantity of the memory 502 and the processing proceeds to step 909.

At step 904, it is determined whether the display position setting slider 106 has been pressed. If the slider 106 has been pressed, the processing proceeds to the step 913. Otherwise, the processing proceeds to the step 905.

At the step 913, the variable REDRAW\_FLAG is set to "1" and the processing proceeds to step 914. At the step 914, a numerical value specified by the mouse 509 is written into an address of a film image display start frame number of the memory 502 and the processing proceeds to the step 909.

At step 905, it is determined whether the film image icon stream display interval setting slider 107 has been pressed. If the slider 107 has been pressed, the processing proceeds to the step 915. Otherwise, the processing proceeds to the step 906.

At the step 915, the variable REDRAW\_FLAG is set to "1" and the processing proceeds to step 916. At the step 916, a numerical value specified by the mouse 509 is written into an address of a film image display start frame number of the memory 502 and the processing proceeds to the step 909.

At step 906, it is determined whether the wipe pattern number, which is inputted by the user and a return to the step 900, is conducted. If the wipe pattern number, which is inputted by the user, has been pressed, the processing proceeds to the step 907. Otherwise, the processing proceeds to the step 917.

When the variable REDRAW\_FLAG is judged to be "1", the step 907 is executed. At the step 917, the variable REDRAW\_FLAG is set to "0". At the step 910, data for special effect window setting is read from the memory 502 and the processing proceeds to step 918. At the step 918, a numerical value specified by the mouse 509 is read and the processing proceeds to step 919. At the step 919, the overlap quantity and the wipe pattern number are read from the memory 502 and the processing proceeds to the step 920. At the step 920, processing for closing the window 101 is conducted. Thereafter, a return to the original display screen is effected, and the effect editing is finished.

Therefore, processing of steps 900 through 910 is repeated until the end of the processing being able to be executed in accordance with displaying of window 101. Individual processing of steps 903 through 908 corresponding to respective events will now be described.

If a decision result at any one of steps 903 through 908 addresses, beginning at the recording address of the film image icon stream number, the hierarchical structure management information file is read from the memory 502 and the processing proceeds to step 920. At step 920, processing for closing the window 101 is conducted. Thereafter, a return to the original display screen is effected, and the effect editing is finished.

way as the case using the moving picture display, therefore, it is possible to make the most of the advantages of the interface 512; the picture compressor/expander 511; and the direct scheme and conduct various effect editing and the audio interface 512 are connected to a bus 510, and various manipulations including the AB role editing efficiently done and controlled by an access signal supplied from the main memory 502 and easily enlarged and reduced and edited. CPU 501 can process editing to interbedding on a moving picture.

Furthermore, in the embodiment of the present invention, it is not necessary to use hardware for different storage medium such as an optical magnetic disk for processing such as the wipe or compression/expansion on the storage device may be used. Or a remote file connected to the processing of pictures. Therefore, it is possible to sufficiently connect to the bus 510 via a network may be used. And editing can be efficiently suppress the cost increase and the size increase for the apparatus. On the basis of the scene change point detection of the apparatus, the scene change point detection information detected by the scene change point detector 503.

An embodiment in which sound information is edited by the CPU 501 takes out a picture located at a scene or cut change position out of the moving pictures and referring to the present invention will now be described by example for high speed display. The CPU 501 displays a representative picture of a scene or a cut to which that picture belongs referring to drawing, and the picture is representative picture of a scene or a cut to which that picture belongs.

FIG. 13 shows an example of an apparatus used for editing. The same reference numerals in FIG. 13 as those of the system in FIG. 5 basically refer to like parts shown in FIG. 14. The term icon refers to a small picture component shown in FIG. 13. The user (editing worker) handles pictures displayed on the monitor 508 and shown in FIG. 14 as the subject of editing manipulation, and a scene change point between cuts. A picture contractor 513 thins out pixels of an original image material and thereby creates moving pictures for high speed display. As for the method and system of the moving image editing pictures for high speed display and stores moving pictures for high speed display and editing using the hierarchical structure, those disclosed in U.S. patent application Serial No. 08/826,975 can be used.

A scene change point detector 503 analyzes the change of color distribution for each frame of moving pictures and detects a scene change point which is a change point between cuts. A picture contractor 513 thins out pixels of an original image material and thereby creates moving pictures for high speed display. A magnetic storage device 506 stores the moving pictures for high speed display and stores moving pictures for high speed display and editing using the hierarchical structure, those disclosed in U.S. patent application Serial No. 08/826,975 can be used. In the tree structure of FIG. 14, a picture located in a middle class, for example, the picture 1303 represents a plurality of pictures 1302 located in the lower class and belonging to the picture 1303 as one group and corresponding to a chapter or section of a story. Similarly, the picture 1304 located in the highest class represents, for example, a plurality of pictures 1303 located in the lower class and corresponds to the whole story. According to this method, editing can be conducted by taking a scene or a cut as the unit. Therefore, assembling of the story is facilitated. In addition, division of the story is facilitated.

A monitor 508 displays the moving pictures stored in the magnetic storage device 506 on the basis of the analyzing information. The monitor 508 also provides the user with an editing screen for implementing a GUI (graphical user interface). By the GUI, the user can conduct various data input manipulations including selection of a picture 1304 located in the highest class represents, for example, a plurality of pictures 1303 located in the lower class and corresponds to the whole story. According to this method, editing can be conducted by taking a scene or a cut as the unit. Therefore, assembling of the story is facilitated. In addition, division of the story is facilitated.

A frame buffer 507 stores images to be displayed on the monitor 508. A main memory 502 stores various control programs. A mouse or keyboard 509 is a command input device of various operations. A video interface 504 is supplied with a video signal from a VTR (video tape recorder) 505, and converts the video signal to a moving image format handled by this apparatus. A picture compressor/expander 511 conducts data compression on original video information and expands the compressed information. An audio interface 512 conducts conversion processing on sound signals so that the sound signals may be exchanged between the VTR 505 and a computer. A CPU 501 controls the above described components and manages their operations.

Together with the CPU 501, the scene change point detector 503, the magnetic storage device 506, the monitor 508, the frame buffer memory 507, the main memory 502, the mouse or keyboard 509, the video interface 504, the picture compressor/expander 511, and the audio interface 512 are connected to a bus 510, and various manipulations including the AB role editing efficiently done and controlled by an access signal supplied from the main memory 502 and easily enlarged and reduced and edited. CPU 501 can process editing to interbedding on a moving picture.

FIG. 13 provides a moving image sound editing method facilitating the editing work of sounds accompanying the moving images, such as overlap editing or mixing editing, by manipulating icons on the display screen. In the sound editing according to the embodiment of FIG. 13, pictures of a portion of image information to be edited are displayed as film images from the left to the right on the display screen. By watching this film image display, it becomes possible to associate picture

information with sound information. (Since the screen contents are displayed on the screen, the stored encoded moving pictures are used in the same way as the case where high speed display is not required; such as the case where the user desires to watch the final edited sound information is facilitated.)

Operation in an embodiment of the present invention. On the other hand, the sound output signal reproduced from the VTR 505 also becomes digitized sound information via the audio interface 512 and is stored in the magnetic storage device 506 (processing 708). Then, the editing worker (operator) commands read-out of the moving pictures for high speed display, registers the picture signal and the sound signal into the magnetic storage device 506 by using the mouse or keyboard 509. The picture signal and the sound signal are outputted from the video tape mounted on the VTR 505, and a process for registration of the scene change point (processing 702) is conducted by the CPU 501.

In response to a command fed from the operator via the mouse or keyboard 509, the picture signal and the sound signal are outputted from the video tape mounted on the VTR 505, and a process for registration of the scene change point (processing 702) is conducted by the CPU 501. In response to this, the CPU 501 reads out the video signal and the sound signal into the magnetic storage device 506 by using the mouse or keyboard 509. At this time, the moving image analyzing information of the corresponding moving image of one frame unit is supplied from the VTR 505 to the CPU 501. On the basis of that information, the CPU 501 reads out only the scene change point detector 503 via the video interface 512 the picture of the only first, for example, frame of each moving image 504 and the bus 510 (processing 701 of FIG. 15) to the scene change point detector 503. The scene change point detector 503 digitizes this picture and displays it in a main window 421 on the monitor 508.

The scene change point detector 503 digitizes this picture and displays it in a main window 421 on the monitor 508. The scene change point detector 503 analyzes the color distribution of the picture and detects a scene change point (processing 702). The scene change point detector 503 also detects a scene change point (processing 702). The scene change point detector 503 also detects a scene change point (processing 702). The scene change point detector 503 also detects a scene change point (processing 702).

Moving image analyzing information (scene analyzing information) including the frame number of the picture, the scene change point generated by the scene change point detector 503 is stored in the magnetic storage device 506 (processing 703). The scene change point detector 503 also detects a scene change point (processing 702). The scene change point detector 503 also detects a scene change point (processing 702). The scene change point detector 503 also detects a scene change point (processing 702).

At the same time, moving pictures for high speed display are stored in the magnetic storage device 506 (processing 704). The scene change point detector 503 also detects a scene change point (processing 702). The scene change point detector 503 also detects a scene change point (processing 702). The scene change point detector 503 also detects a scene change point (processing 702).

The moving pictures for high speed display are stored in the magnetic storage device 506 (processing 704). The scene change point detector 503 also detects a scene change point (processing 702). The scene change point detector 503 also detects a scene change point (processing 702). The scene change point detector 503 also detects a scene change point (processing 702). The scene change point detector 503 also detects a scene change point (processing 702).

For returning an arbitrary image selected out of the screen 420 is displayed. FIG. 17A is an enlarged view of the screen 420. The scene change point detector 503 also detects a scene change point (processing 702). The scene change point detector 503 also detects a scene change point (processing 702). The scene change point detector 503 also detects a scene change point (processing 702).

In this embodiment, contracted pictures for high speed display moving pictures of respective frames in a predetermined section of moving pictures (hereafter referred to as picture A and picture B) respectively, belonging to the scene A and the scene B, from the left to the right in the time series so as to form a film image. The scene change point detector 503 also detects a scene change point (processing 702). The scene change point detector 503 also detects a scene change point (processing 702). The scene change point detector 503 also detects a scene change point (processing 702).

Simultaneously with the scene change point detector 503, the scene change point detector 503 also detects a scene change point (processing 702). The scene change point detector 503 also detects a scene change point (processing 702). The scene change point detector 503 also detects a scene change point (processing 702). The scene change point detector 503 also detects a scene change point (processing 702).

As for the display, the operator manipulates an icon 422 (hereafter referred to as icon 422) and the encoded moving pictures are stored in the magnetic storage device 506 (processing 707). The scene change point detector 503 also detects a scene change point (processing 702). The scene change point detector 503 also detects a scene change point (processing 702). The scene change point detector 503 also detects a scene change point (processing 702).

In order to conduct the overlap editing for adaptively selected picture A and picture B resembling film images and the sound waveforms; the operator conducts the overlap editing by manipulating the sound volume of the sound A and the sound B. The operator controls the sound volume of the sound A and the sound B by controlling and varying the sound volume so as to attenuate the sound A and augment the sound B in and near the splice position 125. The value of the sound volume of the sound A and the sound B is controlled by the CPU 501. The CPU 501 reads out sound information of editing subject A and editing subject B from the magnetic storage device 506. On the basis of the sound information, the CPU 501 generates picture A and picture B. The CPU 501 rewrites the generated sound information into the magnetic storage device 506. The portions of dotted line of the contracted moving picture

As for the manipulation function in that case, for the pictures denote no efficient part for the edited picture, the making possible the sound volume control by selecting the numerals 123 and 124 denote waveform display of the range of the editing subject portion of each sound, the portions of sounds corresponding to the scene A and B are information and setting a predetermined attenuation for the scene B (hereafter referred to as sound 7A and B) as a factor of each sound information, it can be obtained by processing sound B). The waveforms are read out from the storage and displayed, figures including a lateral bar figure display on device 506. At this time, a splice position between the portion 126. A lateral bar 126A corresponds to the 25 scenes is denoted by 125. The editing is now performed on the sound A. The vertical width of its black portion represents the volume control level set for the each predetermined period of the sound A. The explanation of the elements having the same symbol as FIG. 17A is omitted. Numerals 136 and 137 denote edited picture image stream and sound information, respectively, corresponding to the sound B. The vertical width of its image stream black portion represents the volume control level set for the each predetermined period of the sound B. The editing is now performed using the lateral bars 126A and 126B in this embodiment.

According to the sound editing of the present invention, the present embodiment will now be described. By conducting a simple operation, not only the sound amplitude level but also a different work of only specifying four white circle figures 129 and a present sound parameter such as one of a plurality of sound frequency through 132 and moving them in the lateral direction of the quality levels or the musical interval can be adjusted in step 35 while watching the video image, the operator can arbitrarily specify editing sections. For example, he arbitrarily set various parameters required for editing, such as white circles 129 through 132 on the bar figure 126 are used as a sound A attenuation start point position 521, a sound A augmentation end point position 522, a sound B start point position 523, a sound B augmentation end point position 524, split values 525 and so forth. The oblique slant portion of the bar figure 126 represents a gradual change of the sound parameter. Button icons 631, 632 and 633 for specifying the sound amplitude level, sound quality level, and musical interval may be provided in the window as shown in FIG. 21. The operator selects a sound parameter to be edited by clicking any one of the button icons 631, 632 and 633 with the mouse. If a button icon 634 is specified with the mouse, the sound in the editing section (at the time of fading) is subjected to an echo effect.

The white circle figure 129 is a setting icon for setting a level attenuation start point of the sound A. The white circle figure 130 is a setting icon for setting a level attenuation end point of the sound A. The white circle figure 131 is a setting icon for setting a level augmentation start point of the sound B. The white circle figure 132 is a setting icon for setting a level augmentation end point of the sound B.

The image stream 121 and 122 of the film image, sound waveform display portions 123 and 124, the lat-

### The effect editing processing using the lateral bar

display portion 126 will now be described by referring to: first, the scene represented by the icon 1303 displayed by the FIGS. 22 and 23; and then, the scene represented by the tree structure shown in FIG. 14, which will now be described.

By manipulating the lateral bar display portion 607, the state described in the above embodiment can be changed. First of all, manipulation preceding the shift to the moving image stream is 121 and 122, each displayed as a sound mixing editing mode will now be described. In this case, a first requirement is that sound data portions 123 and 124 as shown in FIG. 21, the operator, for example, containing the BGM is stored in the magnetic storage device 506 beforehand. On this premise, a command for reading out this data is issued.

First of all, (a) of FIG. 22 shows such a state that the sound data is input into the present editing apparatus. The operator has provided the picture A and the picture B via the mouse or keyboard 509 to the editing apparatus. Thereupon, the CPU 501 creates an icon 1305 as shown in FIG. 22. The length of this icon (hereafter referred to as sound icon) displayed as same as the overlap portion becomes the length of the wipe.

At this time, the lateral bars 126A and 126B are displayed as shown in FIG. 14. The sound icon 1305 required to handle sound data is linked to the manipulation conducted on the lateral bars 126A and 126B. The sound icon 1305 required to handle sound data is brought into the editing apparatus. Thereafter, by clicking the state shown in (a) of FIG. 22, the sound icon 1305 with the mouse in the same manner.

It is now assumed in the state of (a) of FIG. 22 that in the same way as the icon of the moving pictures, it becomes possible to conduct sound reproduction and insertion work. The white circle figure 129 is dragged with the mouse to a position shown in (b) of FIG. 22. Then a split point is selected. The method for shifting to the sound mixing editing mode will now be described. Each of a fade time length 717 and a sound transition time length 719 between A and B increases by a value corresponding to, for example, 1 frame. There are the following two ways of shifting to the sound mixing editing mode. In a first method, the sound icon 1305 is dragged with the mouse and dropped at the icon 1303. In a second method, the sound icon 1305 and the icon 1303 are selected, and a predetermined button of a button group 130 is clicked.

On the other hand, if a white circle figure 130 is clicked with the mouse. As a result, the screen is moved from the state of (a) of FIG. 22 to the position of (b) of FIG. 23. The display is changed, and the editing screen after the shift to the sound mixing editing mode is shown in FIG. 24. In FIG. 24, numeral 931 denotes a contracted moving image stream obtained by displaying frames of a contracted value, for example, 1 frame. Thus, it is possible to provide a fixed section of moving images belonging to a scene with such an effect that the sound A is heard even after the wipe represented by the icon 1303 (FIG. 14) in a film image. A wipe has been finished in the same way as the above described case. At this time, the sound belonging to the scene represented by the icon 1303 is displayed in a waveform display portion 933.

If a white circle figure 131 is moved from the state of (b) of FIG. 23, then a split point is selected. The method for shifting to the sound mixing editing mode will now be described. Each of a fade time length 717 and a sound transition time length 719 between A and B increases by a value corresponding to, for example, 1 frame. Thus, it is possible to provide a fixed section of moving images belonging to a scene with such an effect that the sound A is heard even after the wipe represented by the icon 1303 (FIG. 14) in a film image. A wipe has been finished in the same way as the above described case. At this time, the sound belonging to the scene represented by the icon 1303 is displayed in a waveform display portion 933.

If a white circle figure 132 is moved from the state of (c) of FIG. 23, then a split point is selected. The method for shifting to the sound mixing editing mode will now be described. Each of a fade time length 717 and a sound transition time length 719 between A and B increases by a value corresponding to, for example, 1 frame. Thus, it is possible to provide a fixed section of moving images belonging to a scene with such an effect that the sound A is heard even after the wipe represented by the icon 1303 (FIG. 14) in a film image. A wipe has been finished in the same way as the above described case. At this time, the sound belonging to the scene represented by the icon 1303 is displayed in a waveform display portion 933.

In the special effect editing of images as well, there is a link between the image reproduction and the sound reproduction. Thus, results of manipulation for respective bars and icons are immediately reflected to each other.

At this time as well, determination of the editing operation can be linked. Thus, results of manipulation for respective bars and icons are immediately reflected to each other. As a concrete example of the sound mixing editing operation according to this embodiment, the case of mixing a BGM (background music) is mixed with a stream 931 displayed in the film image.



At this time, the lateral bar 934M has a function of gradually augmenting the mixing sound at the time of the mixing start as illustrated so that sounds may be mixed without unnaturalness. Although not illustrated, the lateral bar 934M has also a function of gradually attenuating the mixing sound at the time of mixing end.

In this embodiment, it is possible to provide the sound mixing augmentation completion point even by clicking the moving picture stream 931 displayed in the film image with the mouse.

If in the state shown in (a) of FIG. 25 it is desired to make a frame 931F included in the picture stream 931 the mixing augmentation start point of the sound information, this frame 931F is clicked with the mouse. In such a case, "REDRAW\_FLAG" is set to a value of "1" at step 144. Furthermore, a display position specified by the operator representing the level of the sound to be mixed is moved to the frame 931F as shown in (b) of FIG. 25.

Then a white circle figure 935 is moved with the mouse as shown in (c) of FIG. 25. Thereupon, mixing is conducted so that the sound volume control level may be gradually increased in a section 936.

Although not illustrated, the end time point of the sound mixing can also be specified on the lateral bar 934M of the sound with the mouse.

In the case where the editing processing is finished and the editing result is to be determined, the OK button 135 (FIG. 14) is clicked with the mouse.

Moving images with the results of the editing processing heretofore described reflected therein are stored in the magnetic storage device 506. At the same time, alteration of the tree structure information is conducted. As a result, the display returns to the original state. Moving images with the results of the editing processing heretofore described reflected therein are stored in the magnetic storage device 506. At the same time, alteration of the tree structure information is conducted. As a result, the display returns to the original state.

On the other hand, if it is desired to confirm the editing state before the completion of the editing work, the PREVIEW button is clicked with the mouse. Thereupon, the video pictures having a size of 640 by 480 compressed by the picture compressor/expander 511 and stored are reproduced on the monitor 508. In the same way as the case described before, the editing state can be thus confirmed easily.

According to the present embodiment, the relation between the picture and the sound is obtained so as to be quite obvious. While watching the video pictures, therefore, it is possible to easily determine, amend and alter the sound editing point.

Furthermore, according to the present invention, pictures used for editing are obtained as intuitive displays akin to human sensitivity. In sound editing, therefore, skill is not especially required. In this point as well, the editing is facilitated.

By referring to flow charts of FIGS. 27, 28 and 29, procedures of the case where the editing processing

FIG. 27 is a flow chart showing the procedure of the overlap editing shown in FIG. 17A. If the overlap editing mode is selected by the operator, "REDRAW\_FLAG" is set in the memory 502 is initialized to a value of "0". At step 140, the window 420 shown in FIG. 17A is displayed on the monitor 508. At step 142, interrupt input processing from the mouse 509 is conducted.

At step 143, it is determined whether an event of pressing the setting icon 127 has occurred. If the display position setting icon 127 has been pressed, the information, this frame 931F is clicked with the mouse. In such a case, "REDRAW\_FLAG" is set to a value of "1" at step 144. Furthermore, a display position specified by the operator is written into the memory 502 at step 145.

If it is determined at the step 143 that there is no occurrence of an event, it is determined at step 146 whether an event of pressing the display interval setting icon 128 has occurred. If the display position setting icon 128 has been pressed, the "REDRAW\_FLAG" is set to a value of "1" at step 147. Furthermore, a display interval specified by the operator is written into the memory 502 at step 148.

If it is determined at the step 146 that there is no occurrence of an event, it is determined at step 149 whether an event of pressing any one of sound parameter icons 631 through 633 has occurred. If any one of sound parameter icons 631 through 633 has been pressed, the "REDRAW\_FLAG" is set to a value of "1" at step 150. Furthermore, a kind of a control parameter specified by the operator is written into the memory 502 at step 151.

If it is determined at the step 149 that there is no occurrence of an event, it is determined at step 152 whether an event of pressing an echo icon (button) 634 has occurred. If the echo icon 634 has been pressed, the "REDRAW\_FLAG" is set to a value of "1" at step 153. Furthermore, information of the echo effect is written into the memory 502 at step 154.

If it is determined at the step 152 that there is no occurrence of an event, it is determined at step 155 whether an event of pressing the white circle figure 129 has occurred. If the white circle figure 129 has been pressed, the "REDRAW\_FLAG" is set to a value of "1" at step 156. Furthermore, the fade out start time of the sound A is written into the memory 502 at step 157.

If it is determined at the step 155 that there is no occurrence of an event, it is determined at step 158 whether an event of pressing the white circle figure 130 has occurred. If the white circle figure 130 has been pressed, the "REDRAW\_FLAG" is set to a value of "1" at step 159. Furthermore, the fade out end time of the sound A is written into the memory 502 at step 160.

If it is determined at the step 158 that there is no occurrence of an event, it is determined at step 161 whether an event of pressing the white circle figure 131 has occurred. If the white circle figure 131 has been



pressed, the "REDRAW\_FLAG" is set to a value of "1" and the steps 245, 248, 251, 254, 257, 260, 263, 266, 269, 272 are conducted at step 259. Furthermore, the fade in start time of the B and 272 is conducted, it is determined at step 279 whether the sound B is written into the memory 502 at step 260. If the answer whether the "REDRAW\_FLAG" is "1", it is determined whether

If it is determined at the step 258 that there is no occurrence of an event, it is determined at step 261 whether an event of pressing the white circle figure 132 has occurred. If the white circle figure 132 is pressed, the "REDRAW\_FLAG" is set to a value of "1" at step 262. Furthermore, the fade in/end time of the sound B is written into the memory 502 at step 263. If the processing of the step 275 is completed, the

If it is determined at the step 261 that there is no global wipe editing mode is once finished, it is determined at a next occurrence of an event if it is determined at step 264. Next, FIG. 29 is a flow chart showing the procedure in which

whether an event of pressing the picture stream 121 has occurred of the mixing editing shown in FIG. 24. If the mixing edit effect has occurred, if the picture stream 121 has been pressed, editing mode and is selected by the the operator, and the "REDRAW FLAG" is set to a value of "10" at step 315. "REDRAW FLAG" set in the memory 502 is initialized at step 265. Furthermore, the fade in/out time information of SAS is set to a value of "00" at step 340. At step 341, the window of each of the sound A and the sound B is written into the left and right 420 shown in FIG. 24 is displayed on the monitor 508 to the memory 502 according to the preselected state of each loop. At step 342, interrupt input processing from the mouse to the white circle figure at step 266 is made at it, SAS data in memory 509 is conducted. SAS data is a graph static display.

If it is determined at the step 264 that there is no occurrence of an event, it is determined at step 267 whether an event of pressing the picture stream 122 has occurred. If the picture stream 122 has been pressed, the "REDRAW\_FLAG" is set to a value of "1" at step 344. Furthermore, a display position specification of each of the sound A and the sound B is written into the memory 502 according to the preselected state of each sound. If it is determined at the step 343 that there is no occurrence of an event, it is determined at step 346 whether

If it is determined at the step 267 that there is no occurrence of an event, it is determined at step 270 whether an event of pressing the lateral bar display portion (icon 128) has occurred. If the display position setting operation 126 has occurred, if the lateral bar display portion is set to a value of "1" at step 347. Furthermore, a display position 126 has been pressed, the "REDRAW\_FLAG" is set to 1. The interval specified by the operator is written into the memory 502 at step 271. Furthermore, the value of the memory 502 at step 348 is read out to the CPU 10 to enter the association relation between the video picture and the sound. If it is determined at the step 346 that there is no occurrence of an event, it is determined at step 349 whether

If it is determined at the step 270 that there is no REDRAW whether an event of pressing the lateral bar display portion 133 has occurred, it is determined at step 273 whether instruction 934 has occurred. If the lateral bar display portion 133 has occurred, it is determined whether an event of pressing the PREVIEW button 133 has occurred. If the PREVIEW button 133 has been pressed, the "REDRAW FLAG" is set to "on" and the preview window 430 is opened on the display screen at step 274. Furthermore, the time of the mixing sound specified by the operator is input to the play screen at step 274. Furthermore, the window 420 is also written into the memory 502 at step 351. If the operator has pressed the lateral bar display portion 133 on the display screen at step 275 to move the cursor, it is determined at the step 349 that there is no REDRAW.

If it is determined at the step 273 that there is no occurrence of an event, it is determined at step 352 whether an event of pressing the picture stream 931 has occurred. If the picture stream 931 has been pressed, the "REDRAW\_FLAG" is set to a value of "1" at step 353. Furthermore, the fade in start time of the sound is written into the memory 502 at step 354. If it is determined at the step 352 that there is no occurrence of an event, it is determined at step 276 whether an event of pressing the OK button 135 has occurred. If the OK button 135 has been pressed, the picture (image) of the editing result is displayed on the monitor and the editing result is stored in the magnetic storage device 506 at step 277. Then, it is determined whether

If it is determined at the step 276 that there is no occurrence of an event, it is determined at step 355 whether an event of pressing the white circle figure 935 has occurred or after the processing of the step 275 is conducted, it is determined at step 278 whether an event of pressing the white circle figure 935 has occurred. If the white circle figure 935 has been pressed, the "REDRAW\_FLAG" is set to a value of "1" and the processing of the step 275 is conducted. If the CANCEL button 134 has been pressed, the "REDRAW\_FLAG" is set to a value of "1" and the processing of the step 275 is conducted. If the CANCEL button 134 has been pressed, the fade in end time of the sound is written into the memory 502 at step 357.

If it is determined at the step 278 that there is no occurrence of an event or after the processing of one of

whether an event of pressing the PREVIEW button 133 has occurred. If the PREVIEW button 133 has been pressed, the preview window 430 is opened on the display screen at step 359. Furthermore, the window 420 is closed on the display screen at step 360.

If it is determined at the step 358 that there is no occurrence of an event, it is determined at step 361 whether an event of pressing the OK button 135 has occurred. If the OK button 135 has been pressed, the picture (image) of the editing result is displayed on the monitor and the editing result is stored in the magnetic storage device 506 at step 362.

If it is determined at the step 361 that there is no occurrence of an event or after the processing of the step 362 is conducted, it is determined at step 363 whether an event of pressing the CANCEL button 134 has occurred. If the CANCEL button 134 has been pressed, the processing of the step 360 is conducted.

If it is determined at the step 363 that there is no occurrence of an event or after the processing of one of the steps 345, 348, 351, 354, and 357 is conducted, it is determined at step 364 whether the "REDRAW\_FLAG" is "1." If it is determined at the step 364 that the "REDRAW\_FLAG" is "1," the picture corresponding to the edited contents is displayed on the monitor at step 365. Furthermore, the processing returns to the step 340. If it is determined at the step 364 that the "REDRAW\_FLAG" is not "1," the processing returns to the step 340. If the processing of the step 360 is conducted, the overlap editing mode is once finished.

The editing processing programs represented by the flow charts shown in FIGS. 27 through 29 are stored on the memory 502 in a code signal form which can be read by the CPU 501. The memory 502 may be a recording medium such as a semiconductor memory, a CD-ROM, a magnetic disk, or an optical disk.

It is evident that the present invention is not limited to the embodiments heretofore described, and persons skilled in the art may conduct various improvements and modifications on the basis of the disclosure.

#### Claims

1. An image information material editing method for conducting editing processing on an image information material with an aid of computer, comprising the steps of:
  - a) reading out a plurality of image streams from said storage device;
  - b) storing information of said image information material into a storage device;
  - c) reading out a plurality of image streams to be edited within said image information material from said storage device;
  - d) editing said plurality of image streams so as to generate an edited image stream; and
  - e) simultaneously displaying the image streams to be edited and said edited image streams.

2. An image information material editing method according to claim 1, wherein said displaying step comprises a step of displaying information representative of editing performed on said image streams to be edited.

3. An image information material editing method according to claim 2, wherein said information represents the position of the editing in said image streams to be edited.

4. An image information material editing method according to claim 1, wherein said image streams are read out from said storage device, is displayed on the screen in first and second film images (102, 103) formed by a connection of a plurality of frame images;

5. An image information material editing method according to claim 4, further comprising the step of creating (513) contracted images by reducing pixels of said image streams and storing the contracted image streams in said storage device (506) wherein the image streams of said film image are created from said contracted images read out from said storage device and displayed on the screen together with said first and second film images (102, 103).

6. An image information material editing method according to claim 5, further comprising the step of representing a specified editing range of said image streams by bar figures (105, 106) each having a time axis as a longitudinal direction thereof, and displaying said bar figures on the screen together with said first to third film images.

7. An image information material editing method according to claim 6, further comprising the step of altering the editing range by altering the lengths of said bar figures.

8. An image information material editing method according to claim 7, wherein in case of editing of mutually overlapping and coupling portions of first and second moving picture information, a first bar figure (102) corresponding to said first moving picture information and a second bar figure (103) corresponding to said second moving picture information are displayed on the screen.

- screen; and the first and second bar figures are displayed so that an overlap region of the first and second moving picture information may be recognized; and pictures obtained by mutually overlapping and coupling; the first and second moving picture information in said overlap region are displayed on said screen as said third film image. (104)
9. An image information material editing method according to claim 8, wherein said editing by mutually overlapping and coupling portions of the first and second moving picture information is editing processing of gradually changing from pictures of the first moving picture information to pictures of said second moving picture information in said overlap region.
10. An image information material editing method according to claim 1, wherein said moving picture information and sound information (123; 124, 126) relating to said moving picture information are displayed on said screen in a common time axis; editing processing (631-634) for adjusting parameters relating to sounds of the sound information in said editing position is commanded by the user; and the result of editing of the sound information is displayed on said screen.
11. An image information material editing method according to claim 10; wherein in case of editing of said moving picture information in a film image; displaying film images (121; 122) of a plurality of different moving picture information pieces on the screen so as to be distinguishable from each other, and mutually coupling said different moving picture information pieces; editing processing of adjusting the parameters relating to the sounds of the sound information in said editing position is arbitrarily commanded by the user; and the result of editing of the sound information is displayed on said screen.
12. An image information material editing method according to claim 11, wherein in case of overlap editing of mutually overlapping portions of said different moving picture information pieces: an overlap region of said different moving picture information pieces is displayed on the screen; editing processing of adjusting the parameters relating to the sounds of the sound information in said overlap region is arbitrarily commanded by the user; and the result of editing of the sound information is displayed on said screen as said third film image. (104)
13. An image information material editing method according to claim 12, wherein a displayed editing position of said sound information is changed so as to be linked to an alteration of the editing position of said moving picture information; the result of editing of the sound information is displayed on said screen.
14. An image information material editing method according to claim 12, wherein editing processing for changing an amplitude level of the sound of the sound information in said editing position is commanded by the user; and the result of editing of the sound information is displayed on said screen.
15. An image information material editing method according to claim 14; wherein the amplitude level of the sound is displayed on the screen by using a bar figure; and a change point of the amplitude level is displayed on said bar figure by using a specific figure.
16. An image information material editing method according to claim 15; wherein a change start point (129, 131) and a change end point (130; 132) of said amplitude level are displayed on said bar figure by using said specific figures.
17. An image information material editing method according to claim 10, wherein in case of editing of displaying said moving picture information in a film image, and mixing predetermined sound information in a portion of said moving picture information: a position (935; 935M) of the moving picture information in which said predetermined sound information is to be inserted is arbitrarily specified by the user's command; said predetermined sound information is coupled with said moving picture information in the specified position in accordance with said command; and a figure (1101) indicating that said predetermined sound information is mixed with said moving picture information is displayed on said screen.

18. An image information material editing method according to claim 17, wherein when said predetermined sound information is stored in said storage device, a figure (1103) identifying said predetermined sound information is displayed on said screen; and

when the user specifies said figure identifying said predetermined sound information and superimposes said figure on a film image of desired moving picture information, said predetermined sound information is mixed with the moving picture information with said figure identifying said predetermined sound information superimposed thereon.

19. An image information material editing method according to claim 10, further comprising the step of creating contracted moving pictures by thinning pixels of said moving picture information and storing the contracted moving pictures in said storage device,

wherein the moving pictures of said film image are created from said contracted moving pictures read out from said storage device and displayed.

20. An image information material editing system for conducting editing processing on a video information material containing sound information and moving picture information with the aid of a computer (501), said video information material editing system comprising:

a storage device (506) for storing information of said video information material;  
means (501) for reading out said video information from said storage device;  
a display device (508) for displaying said read out video information; and  
editing control means (501) responsive to a user's command, for displaying an editing position of said video information, altering said editing position, conducting commanded editing processing on video information, and displaying edited video information on a screen of said display device.

21. An image information material editing system according to claim 20, wherein said editing control means (501) comprises:

means (101, 103, 121, 122) for forming first and second film images formed by a connection of a plurality of frame pictures from said moving picture information read out from said storage device;  
means (104, 105) for forming a third film image

from the moving picture information with the specified picture editing processing conducted thereon; and  
means for displaying said first to third film images together on the screen;

22. An image information material editing system according to claim 21; further comprising:  
picture contracting means for creating contracted moving pictures by thinning out pixels of said moving picture information and storing the contracted moving pictures in said storage device; and  
means for creating the moving pictures of said film image from said contracted moving pictures read out from said storage device;

23. An image video information material editing system according to claim 20; wherein said editing control means comprises:  
means for displaying said moving picture information and sound information relating to said moving picture information on said screen in a common time axis; and  
means for displaying a result of editing of the sound information commanded according to a command for adjusting parameters relating to sounds of the sound information in said editing position.

24. A computer program product comprising a computer usable medium having computer readable program code means embodied in said medium for conducting editing processing of a video information material containing sound information and moving picture information, said computer readable program code means comprising:

means for reading out said video information from a storage device storing information of said video information material;  
means for displaying said read out video information on a display device;  
means for displaying an editing position of said video information on said display device according to a command from a user;  
means for altering said editing position upon a command from the user;  
means for conducting editing processing specified by the user on video information located in the displayed editing position; and  
means for displaying edited video information on the screen.

25. A computer program product according to claim 24, said computer readable program code means fur-

1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the situation.



FIG. 1

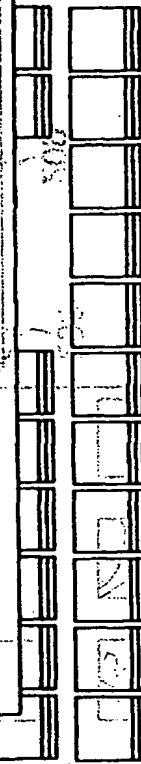
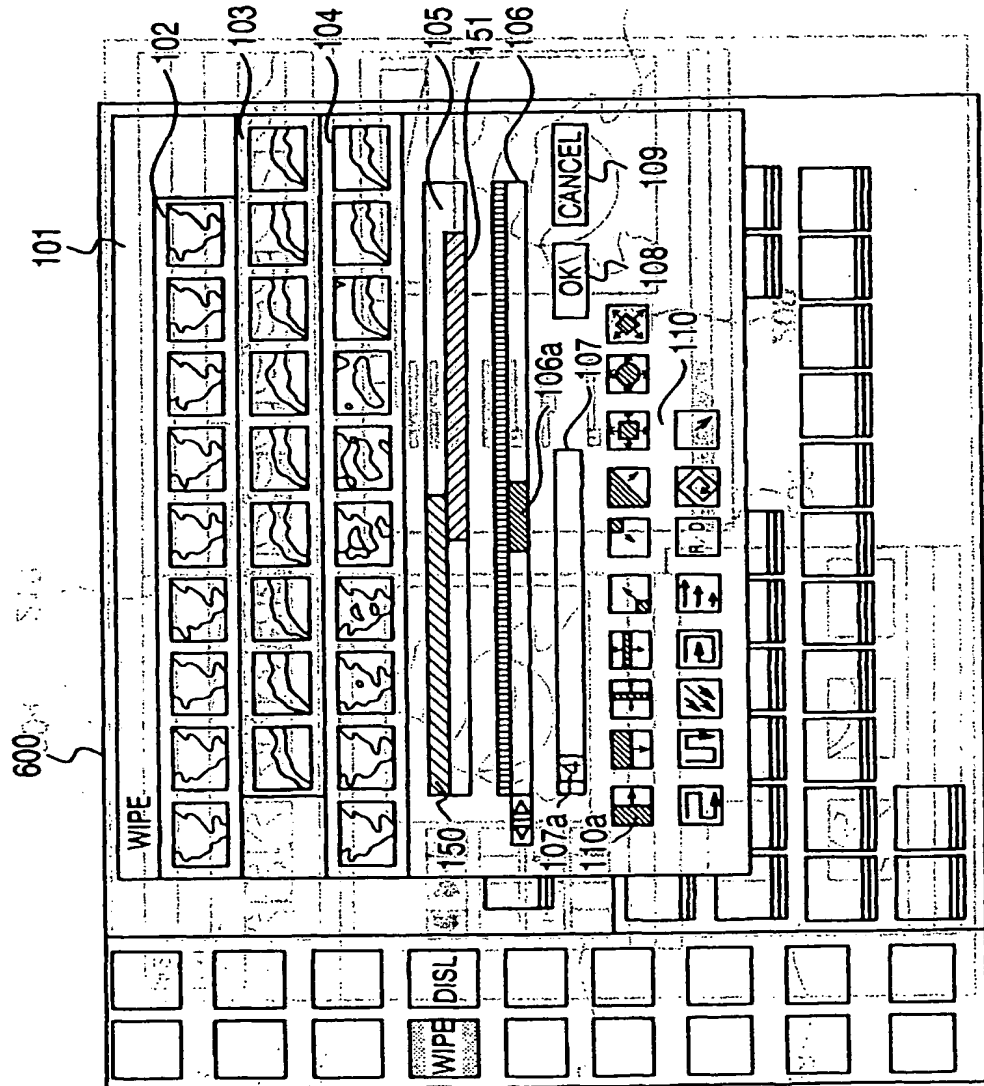


FIG. 2

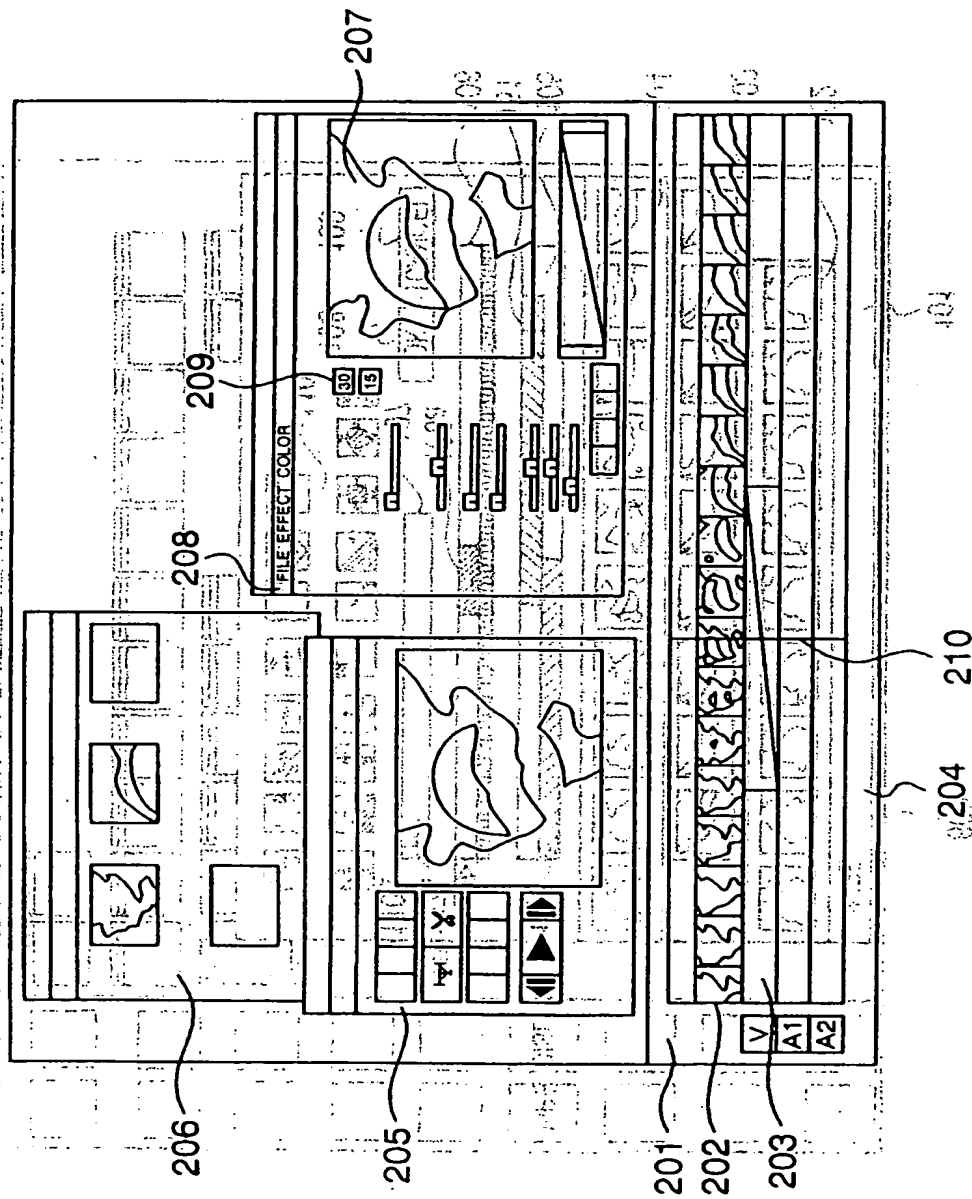
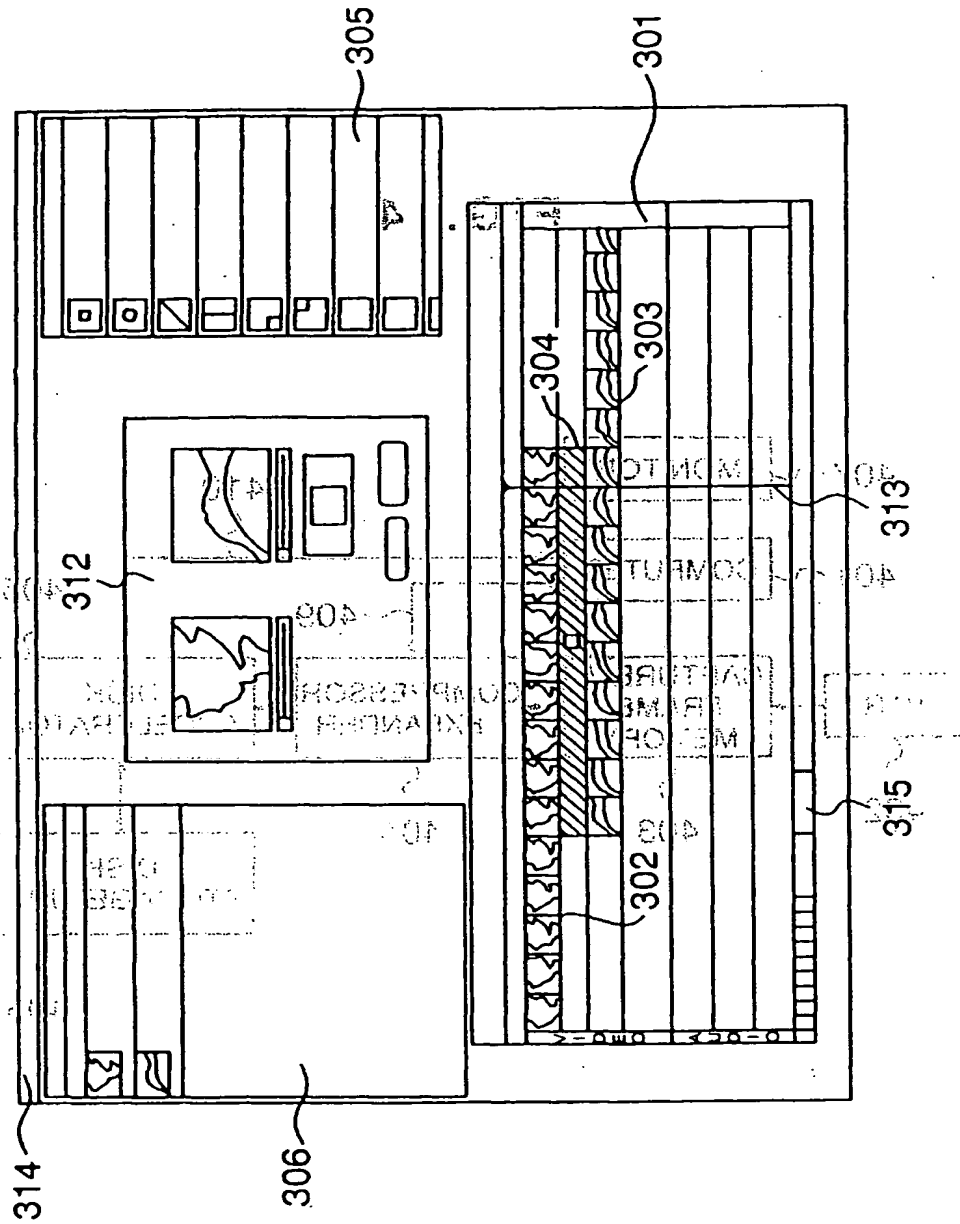
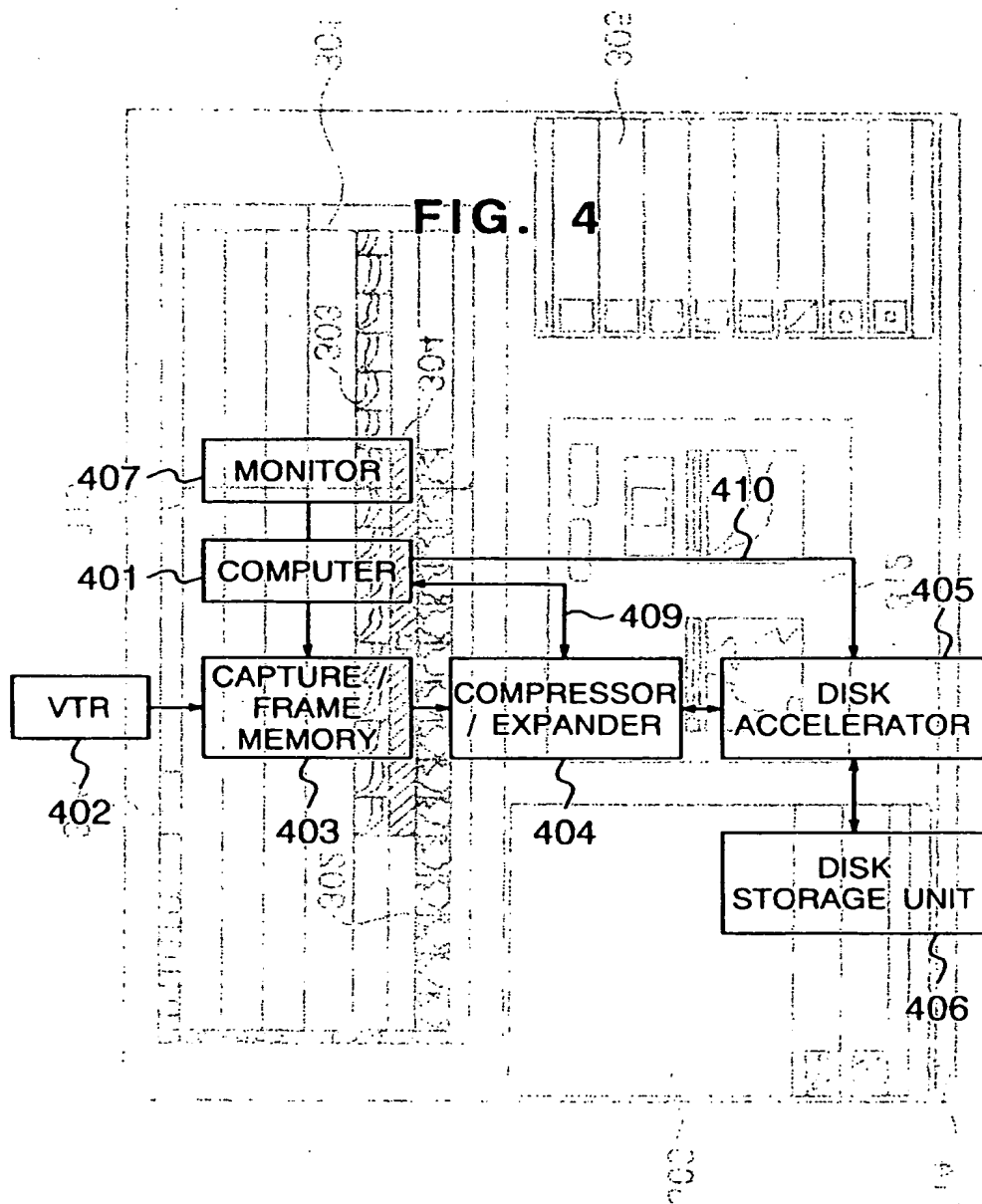


FIG. 3





2 019

FIG. 5

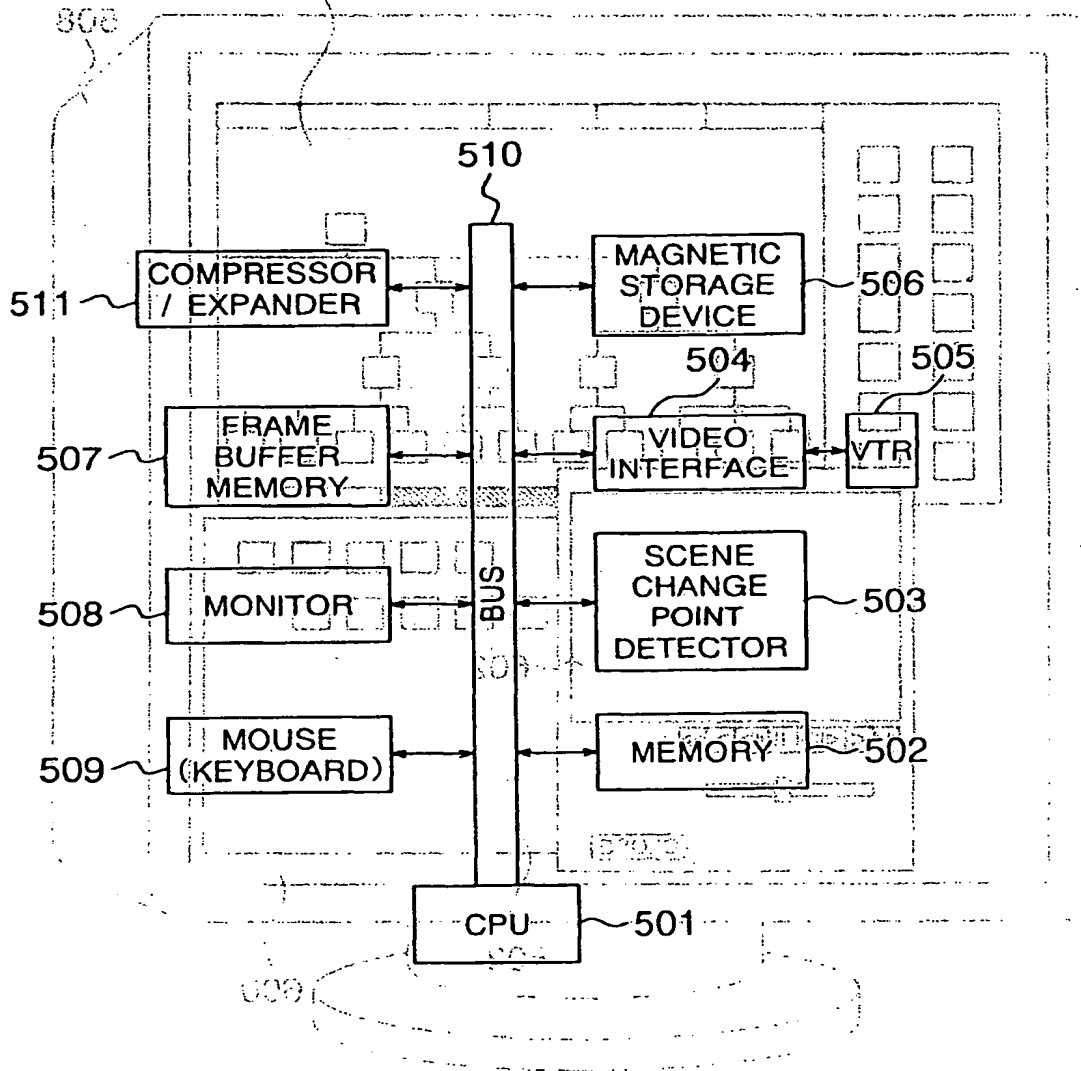


FIG. 6

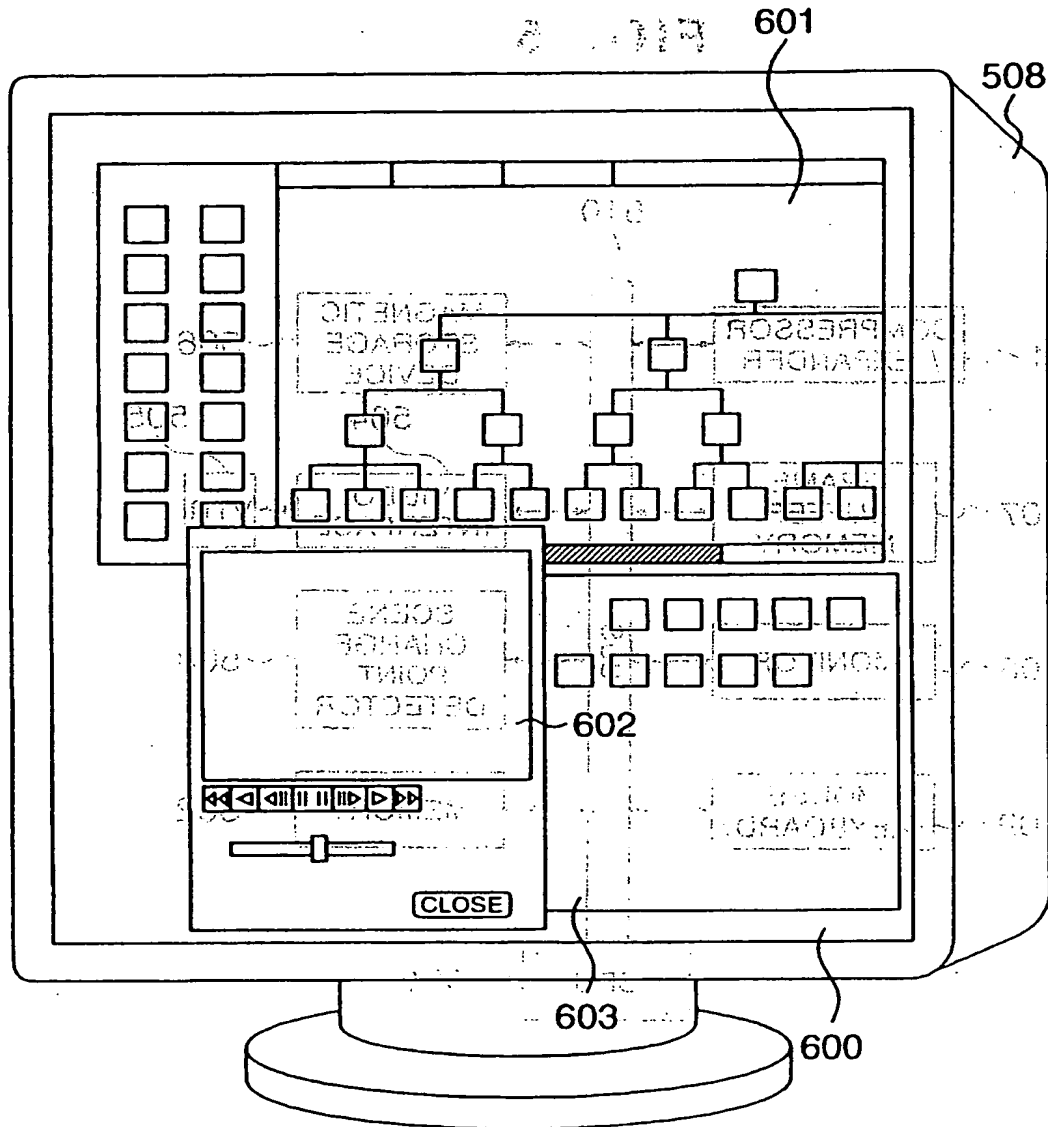


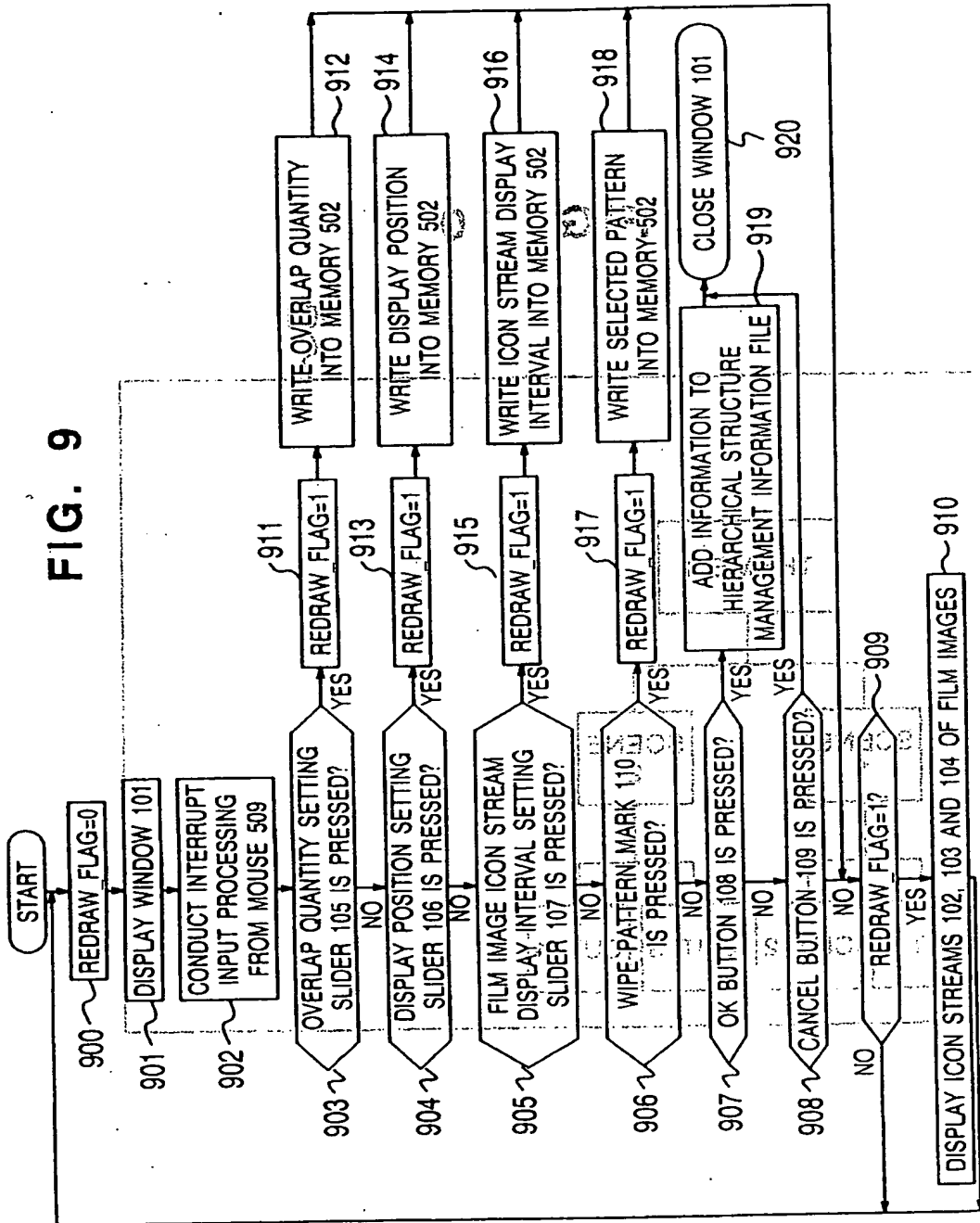


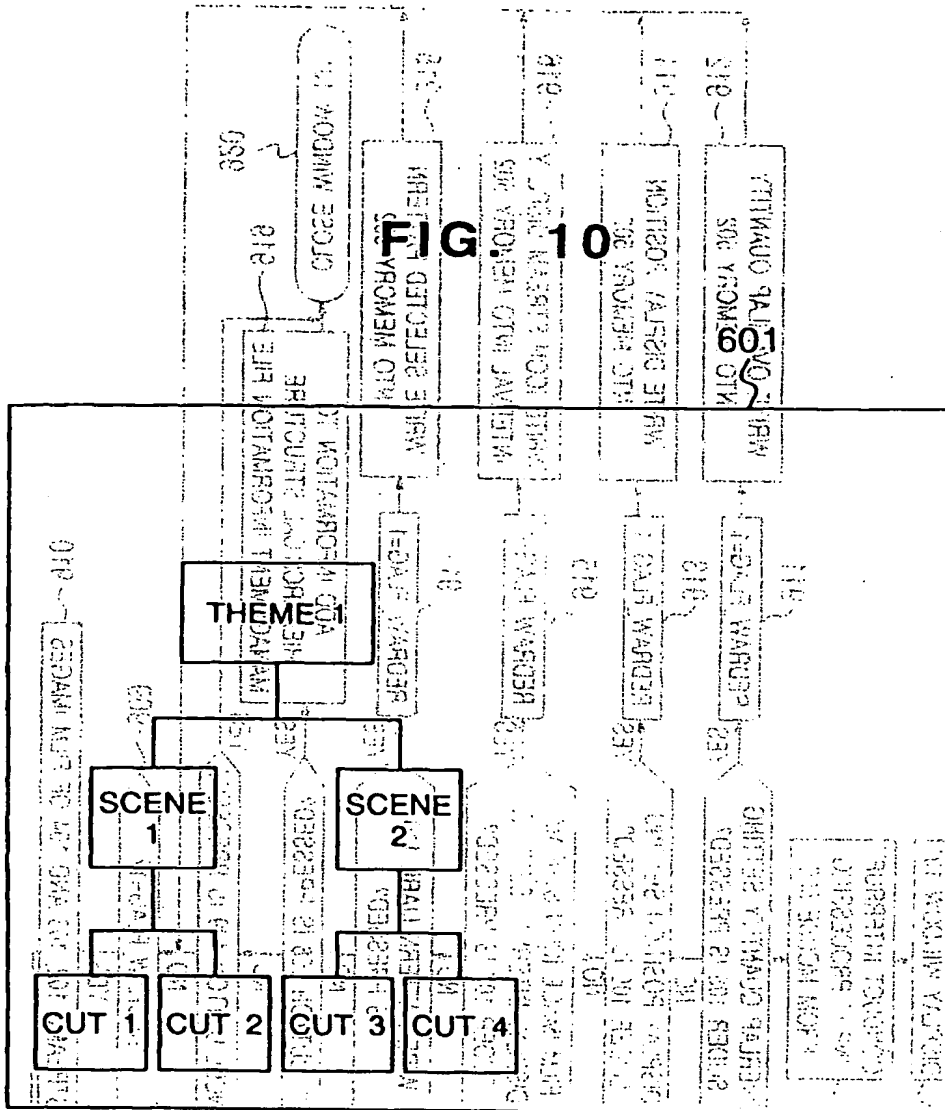


FIG. 8

HIERARCHICAL No.	HIERARCHICAL No.	HIERARCHICAL No.
PICTURE No.	SCENE No.	CUT No. 621
CHILED SCENE No.1	PARENT PICTURE No.1	CUT LENGTH
CHILED SCENE No.2	CHILED CUT No.1	FILE NAME FOR HIGH SPEED DISPLAY 622
CHILED SCENE No.3	CHILED CUT No.2	ADDRESS OF HIGH SPEED DISPLAY PICTURE
...	CHILED CUT No.3	CUT ICON DISPLAY COORDINATES
PICTURE ICON DISPLAY COORDINATES 620	SCENE ICON DISPLAY COORDINATES	DISPLAY IDENTIFIER
DISPLAY IDENTIFIER	DISPLAY IDENTIFIER	...
...	...	...

FIG. 9





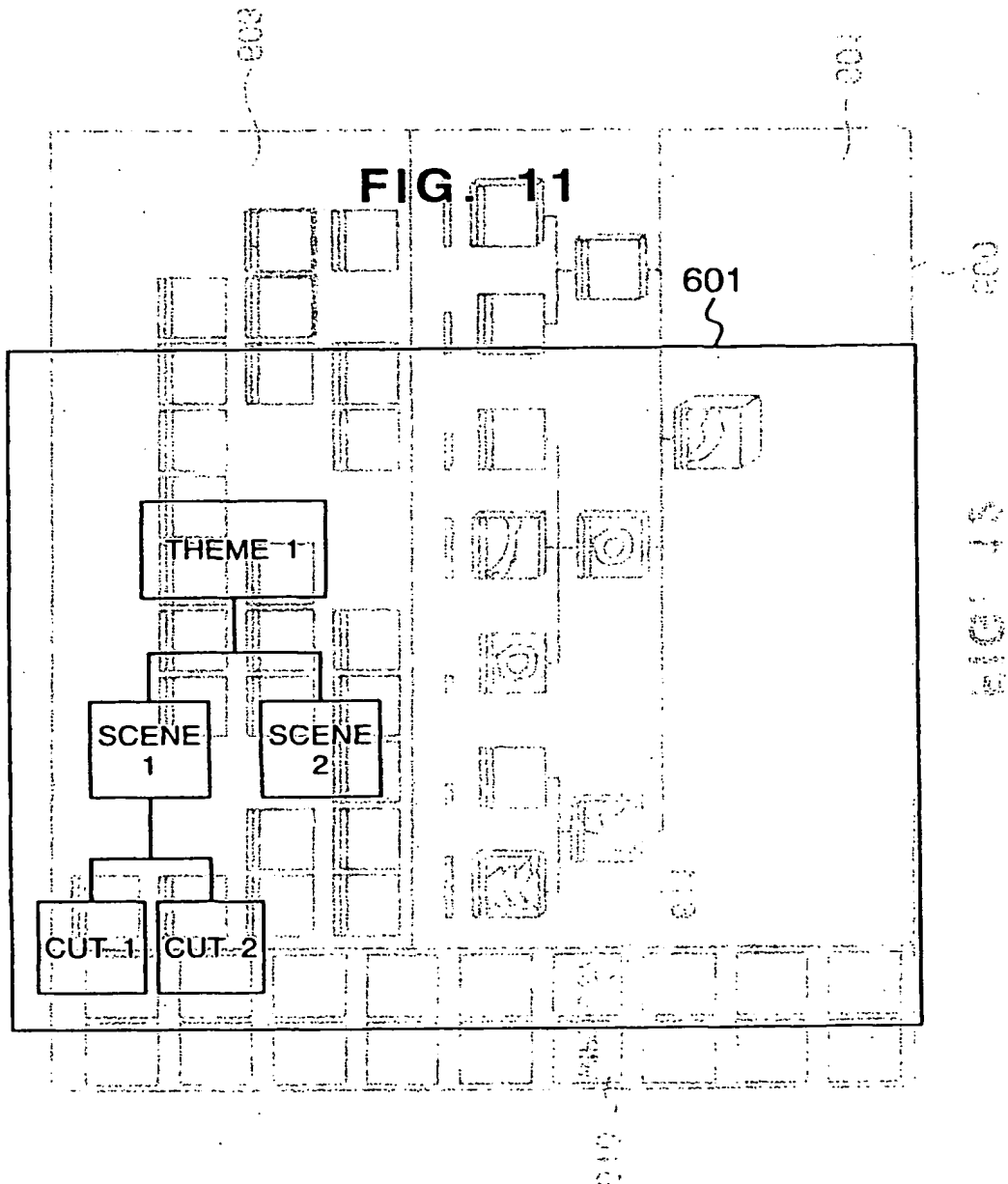


FIG. 12

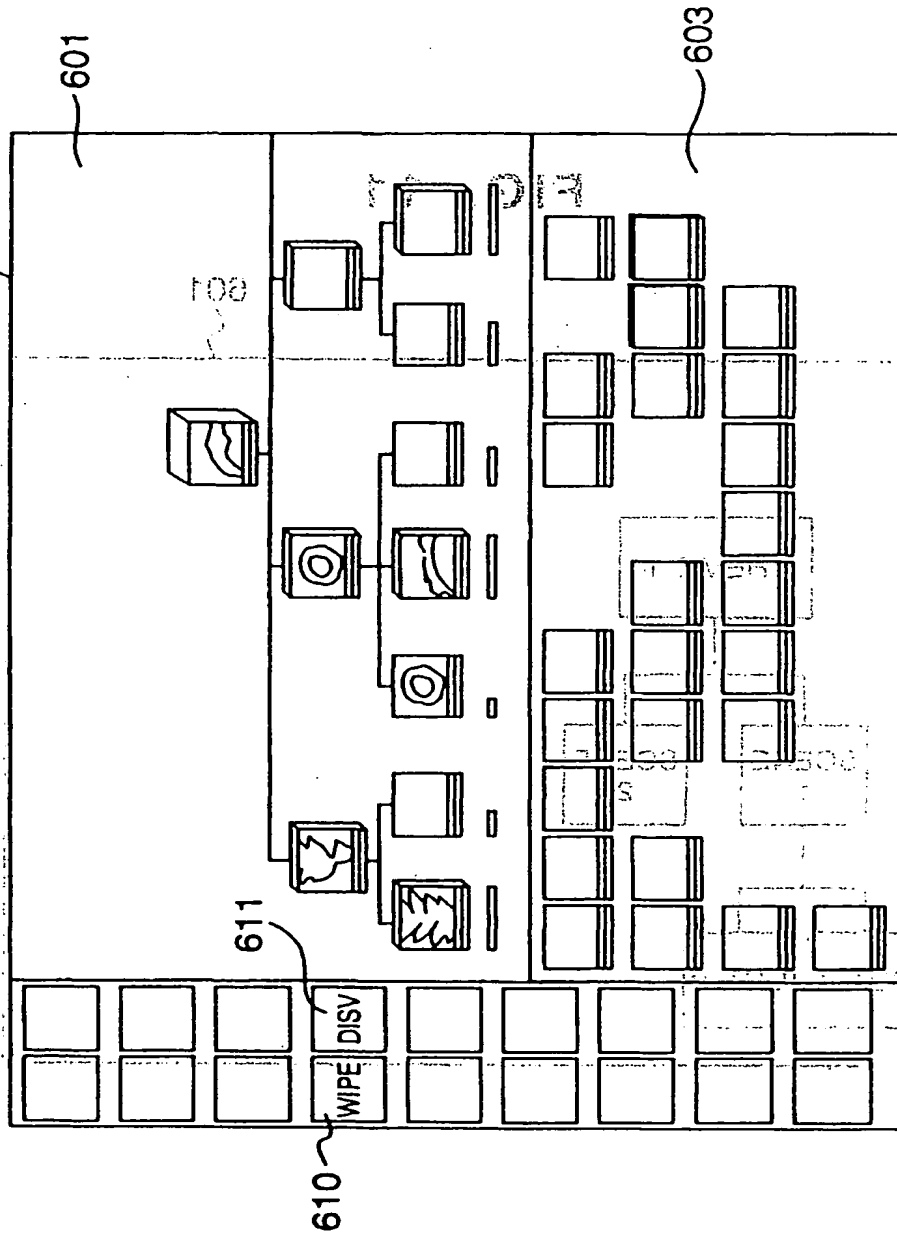


FIG. 13

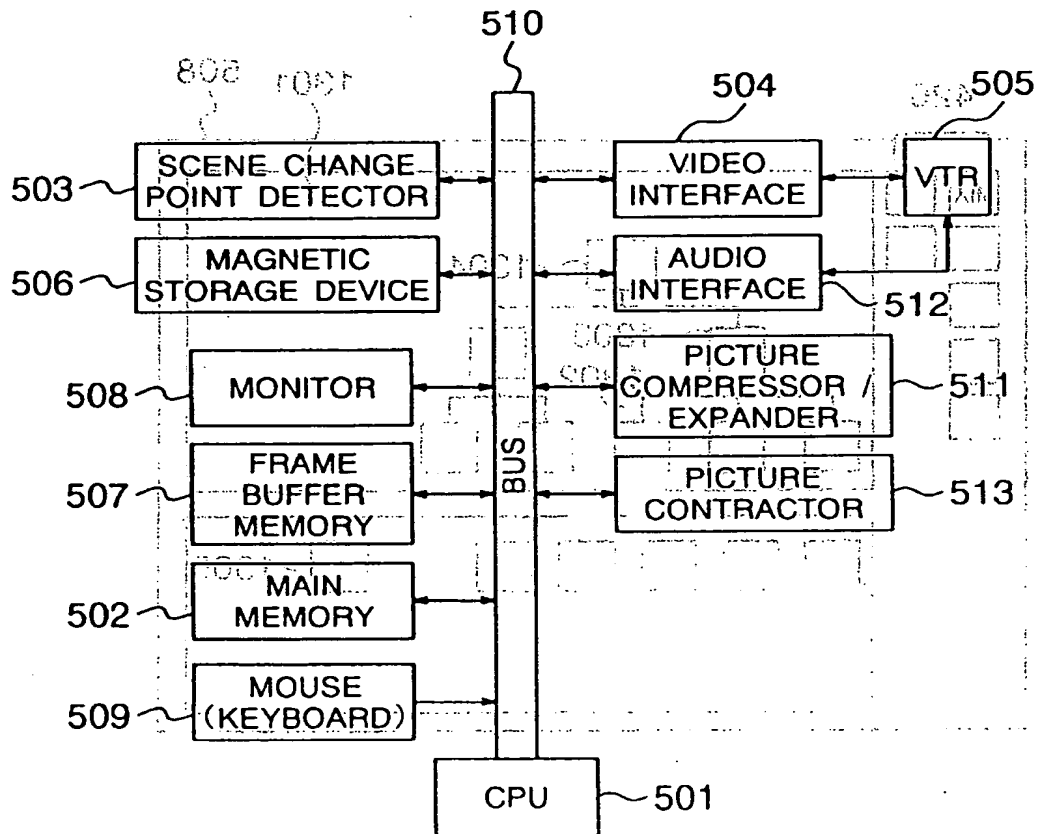


FIG. 14

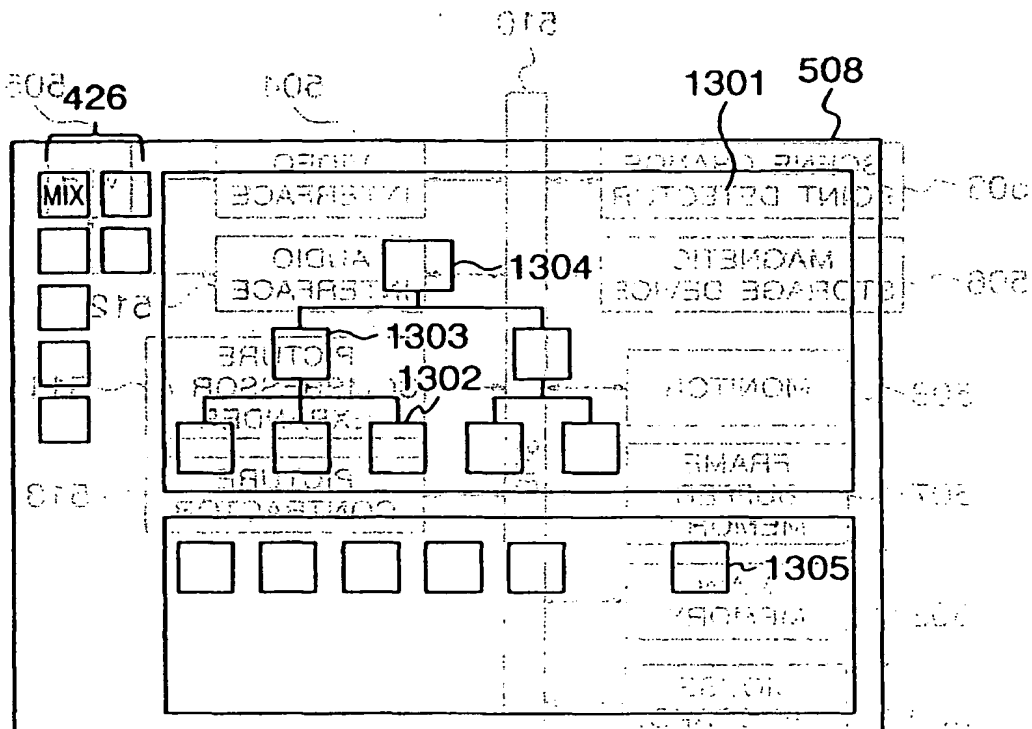
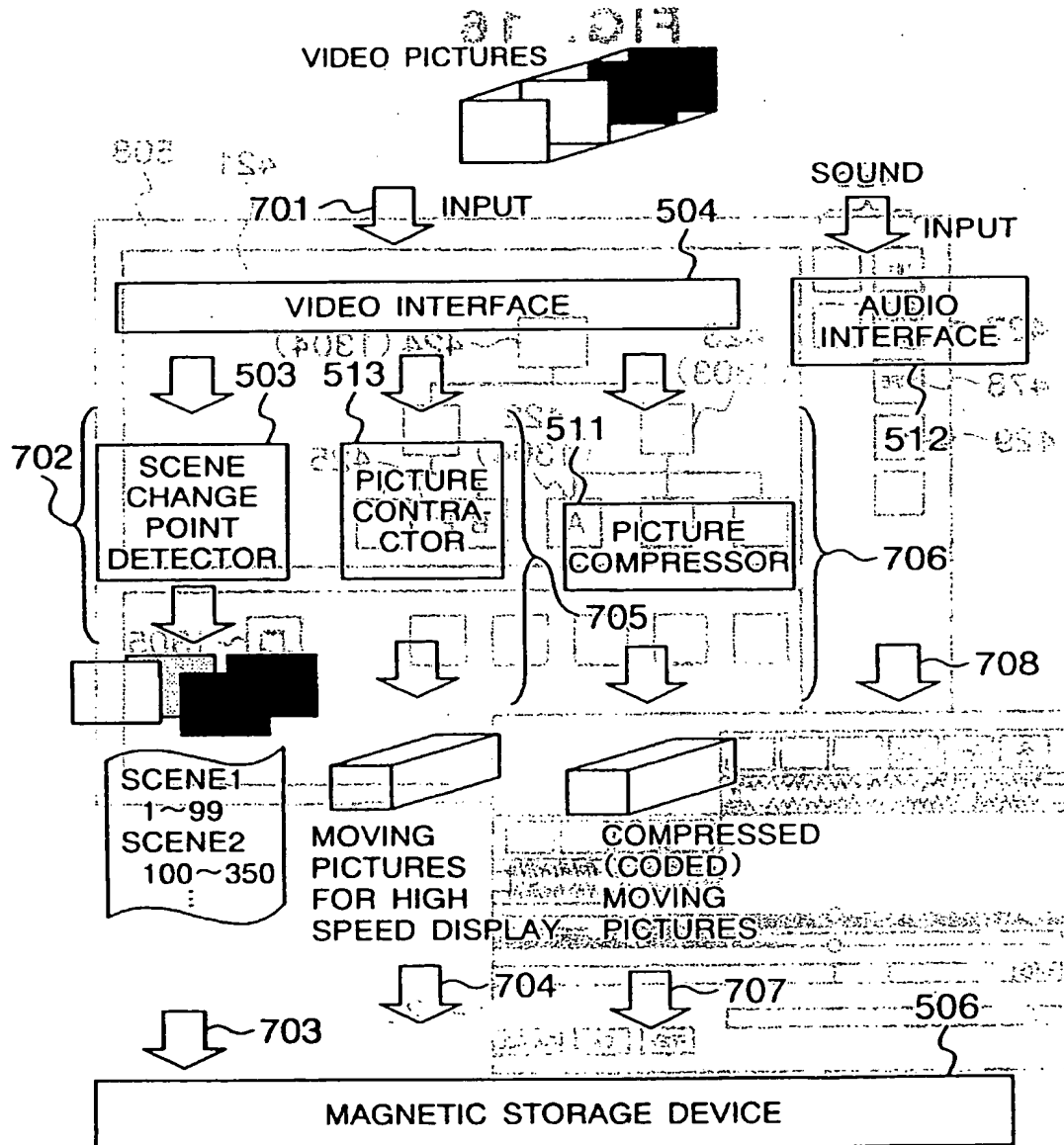




FIG. 15



**FIG. 16**

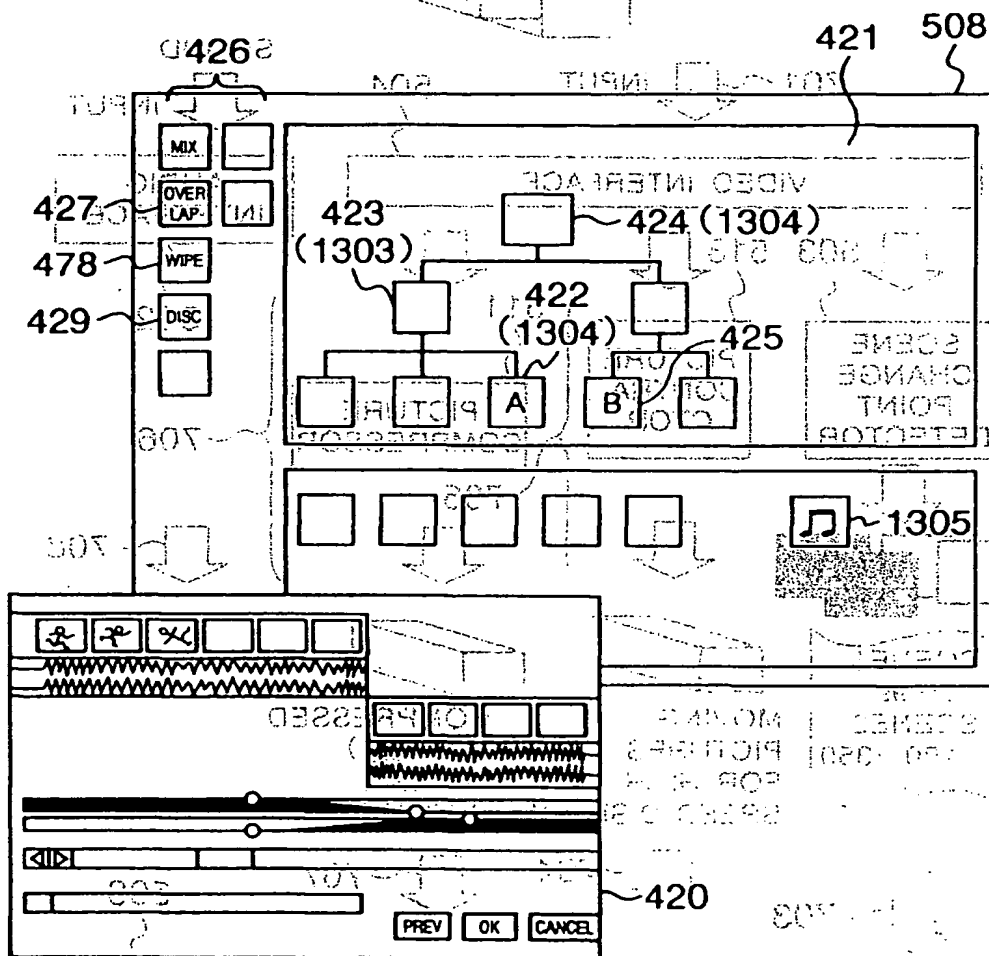
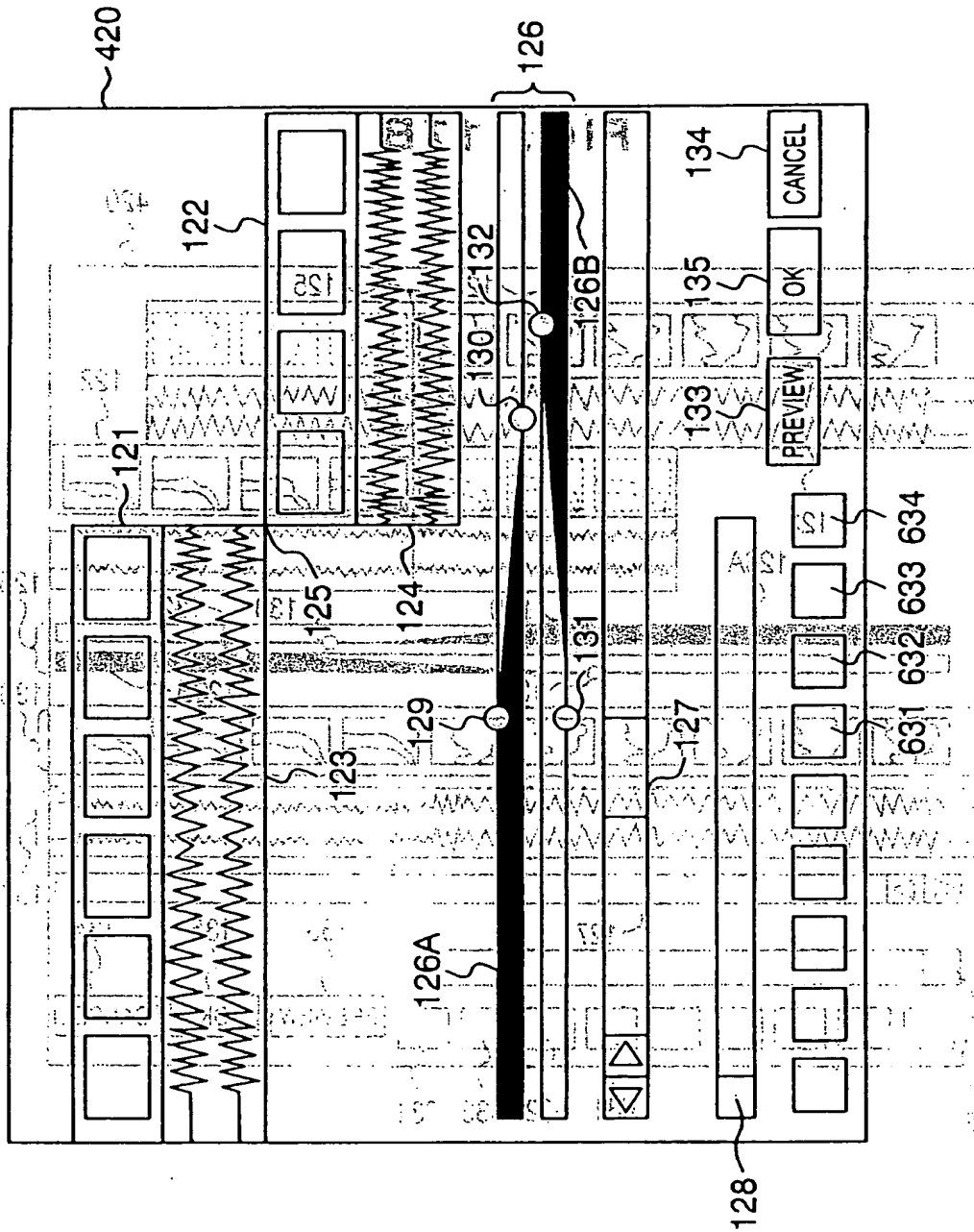


FIG. 17A



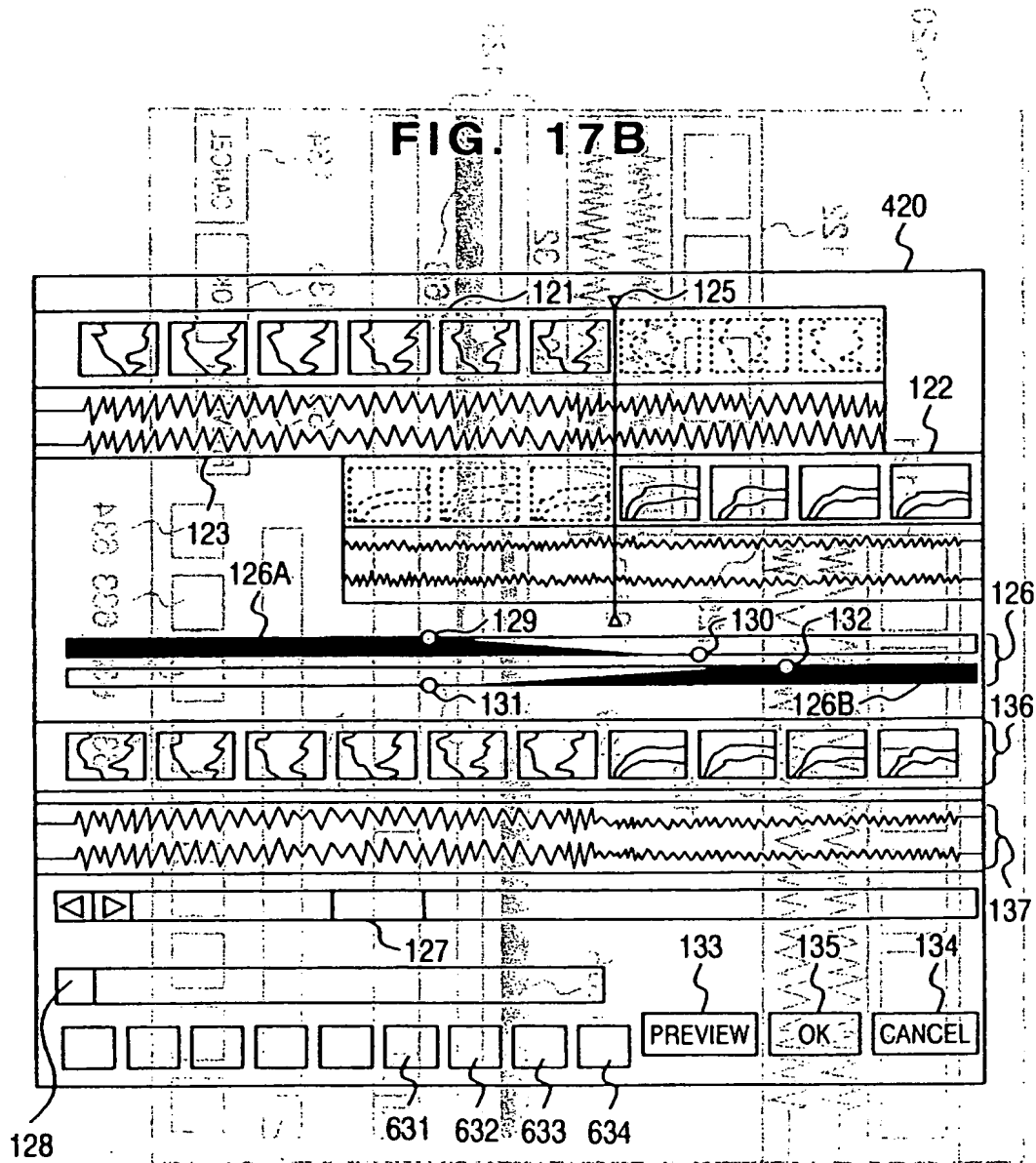


FIG. 18

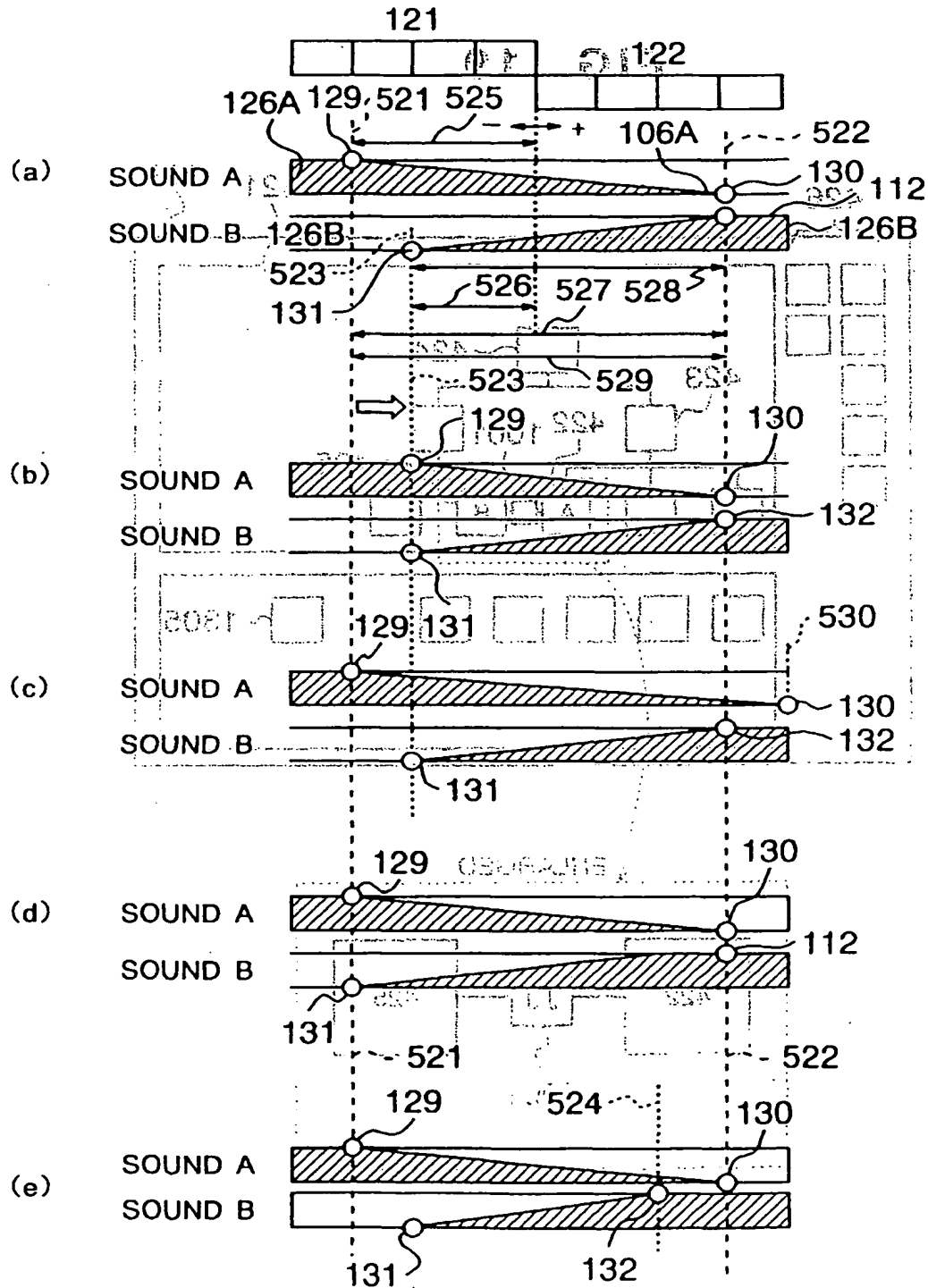
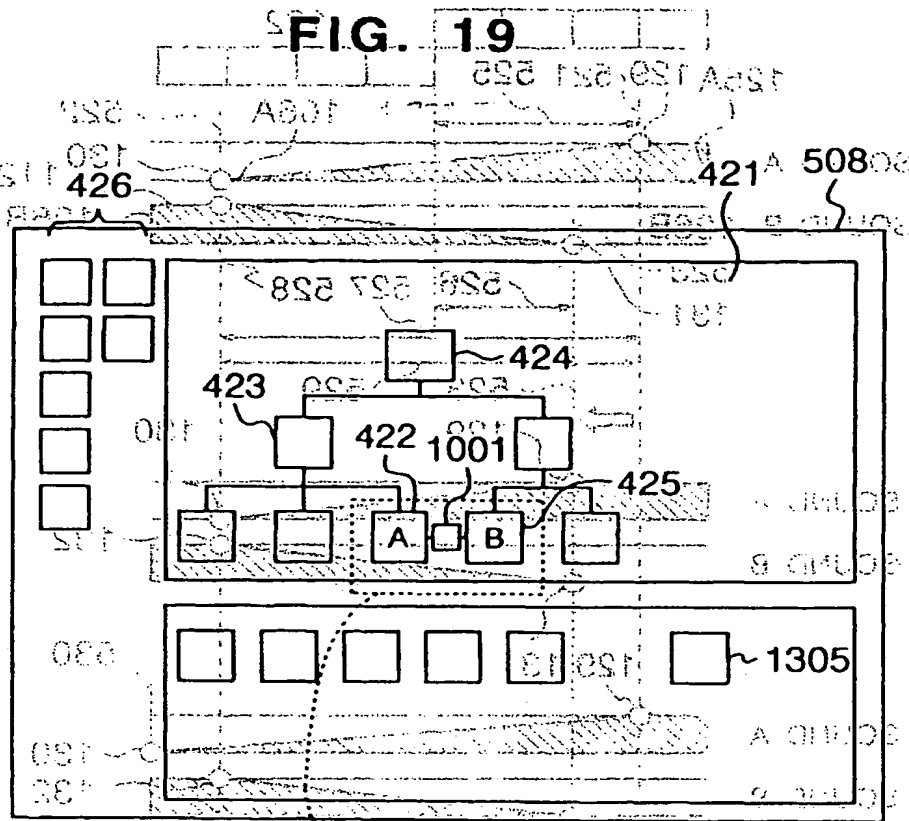


FIG. 19



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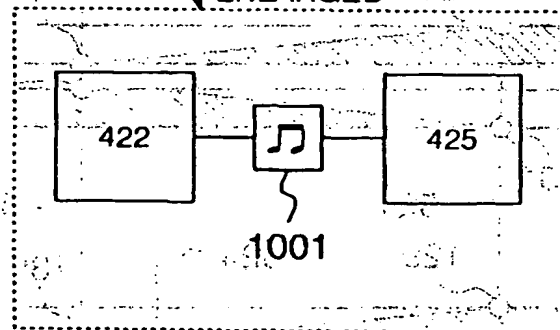


FIG. 20 430

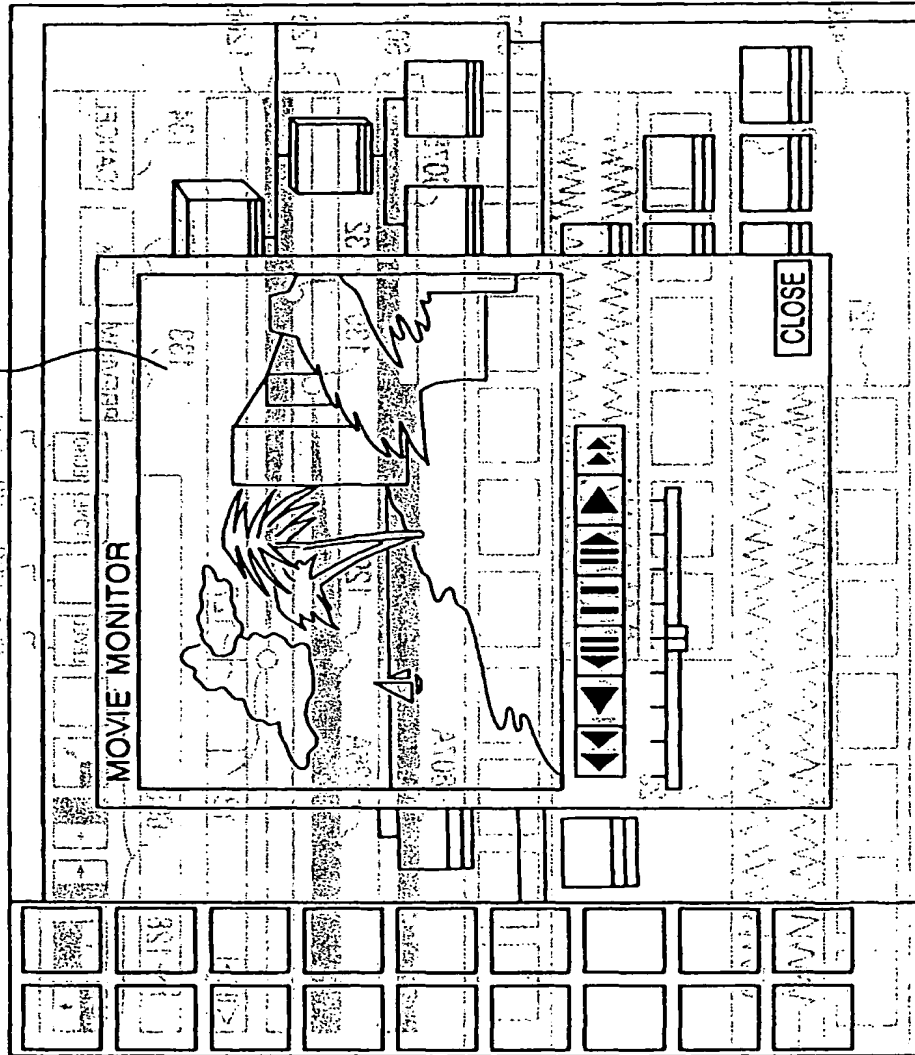
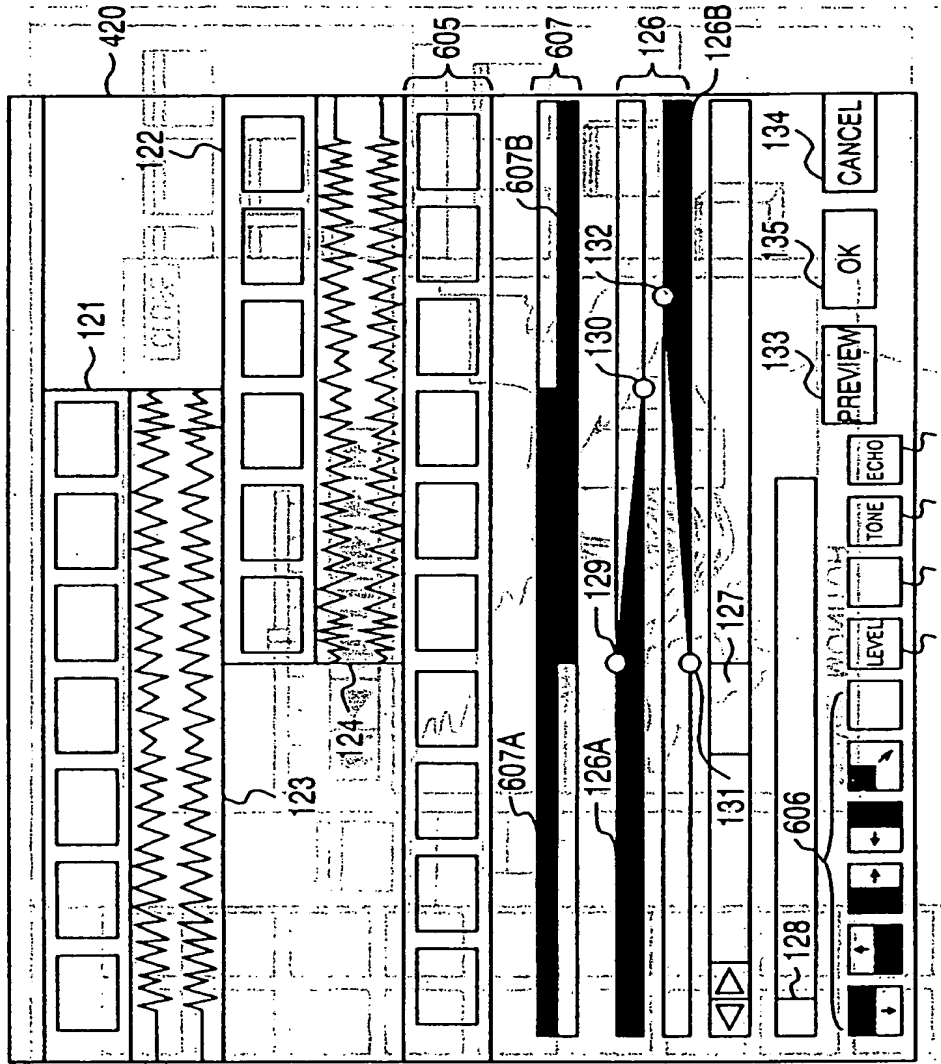


FIG. 51

FIG. 21



631 632 633 634

FIG. 20



FIG. 22

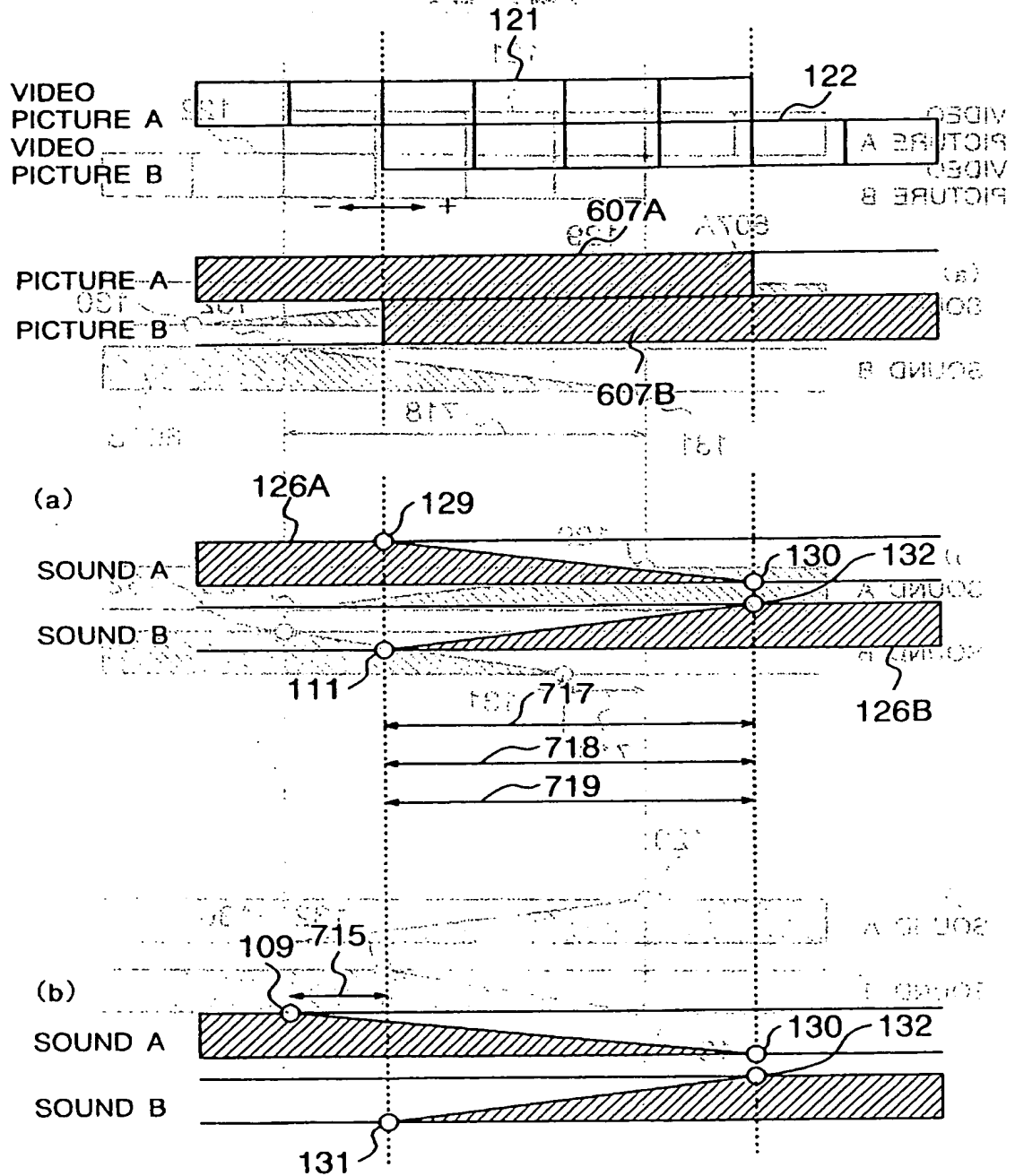




FIG. 24

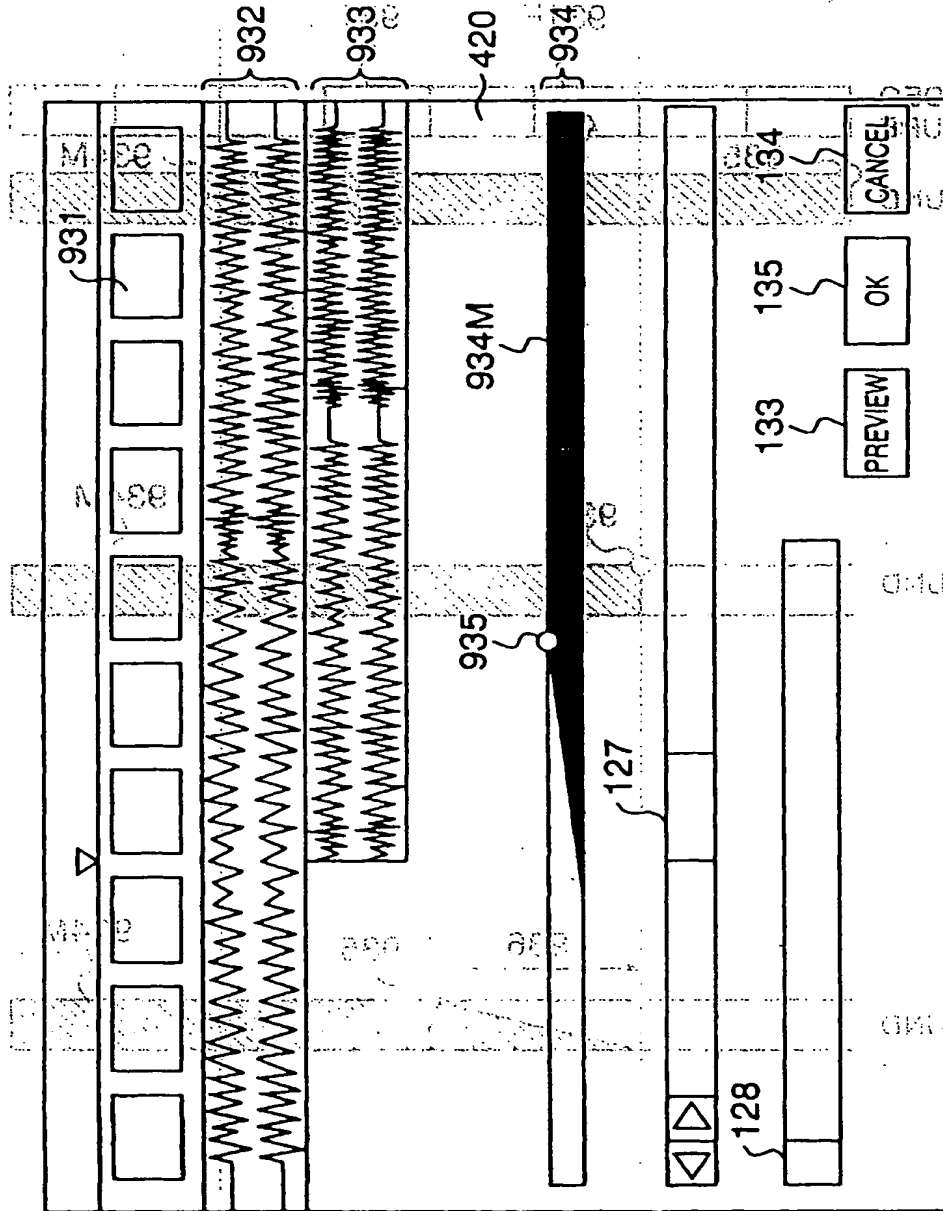
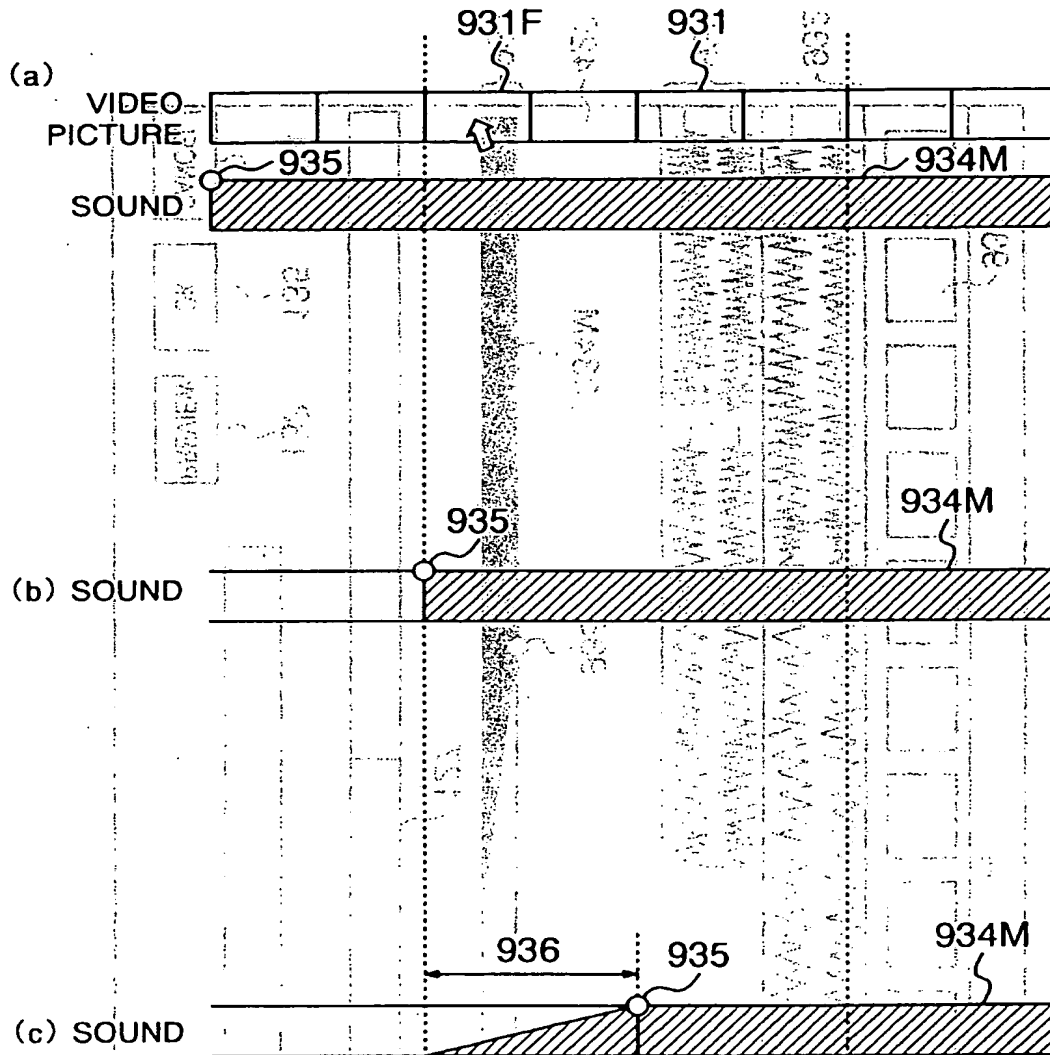
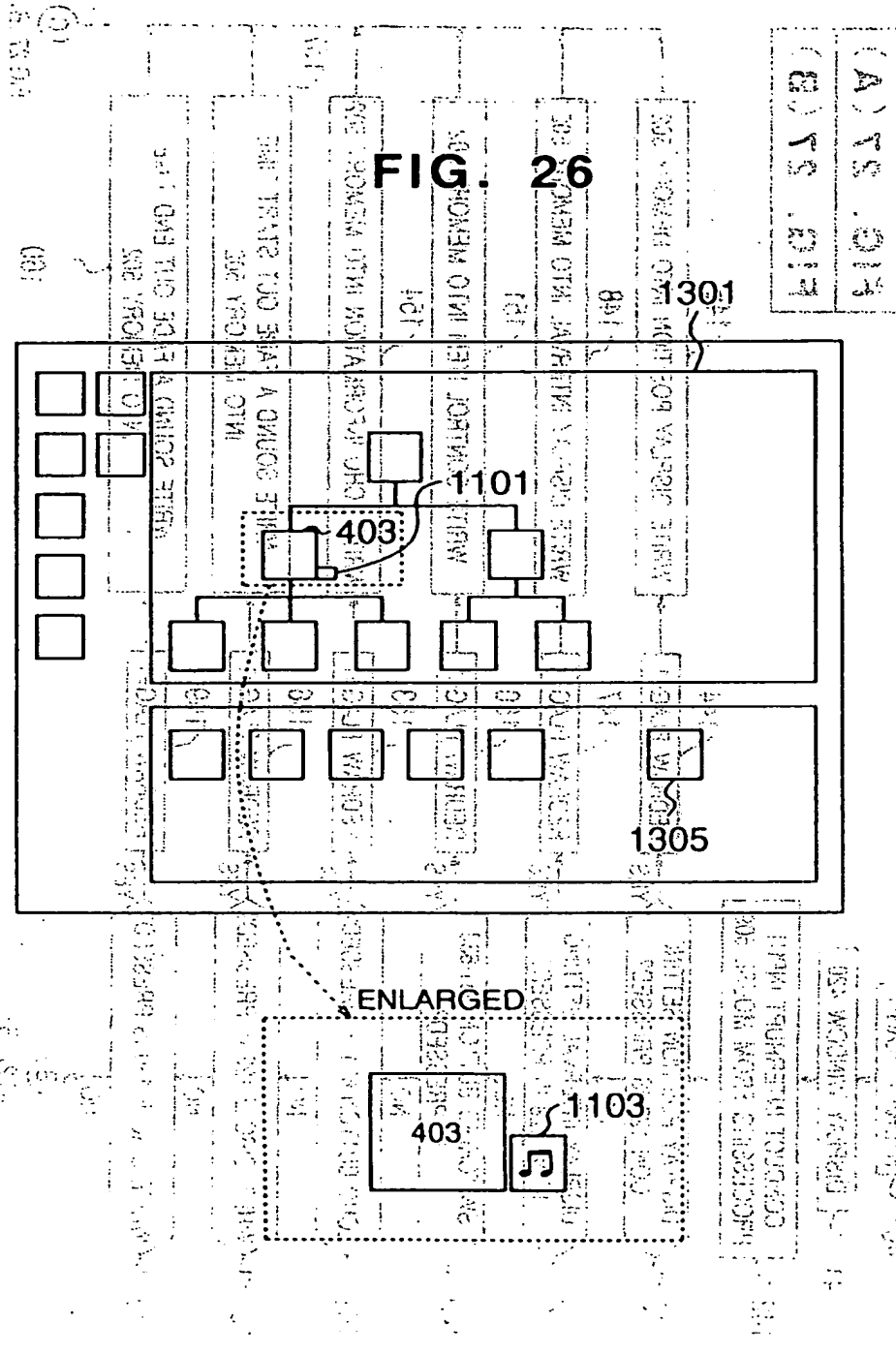
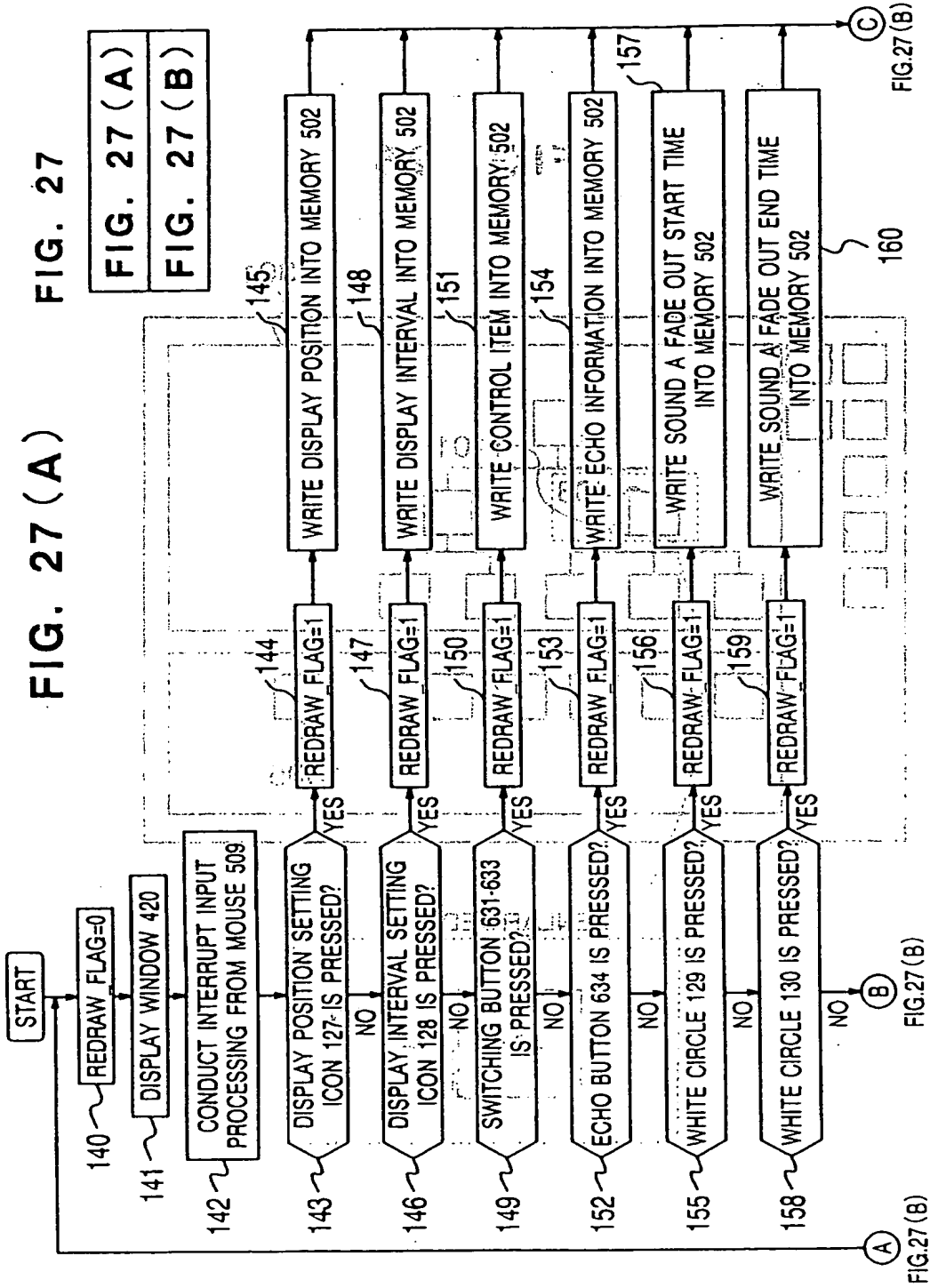
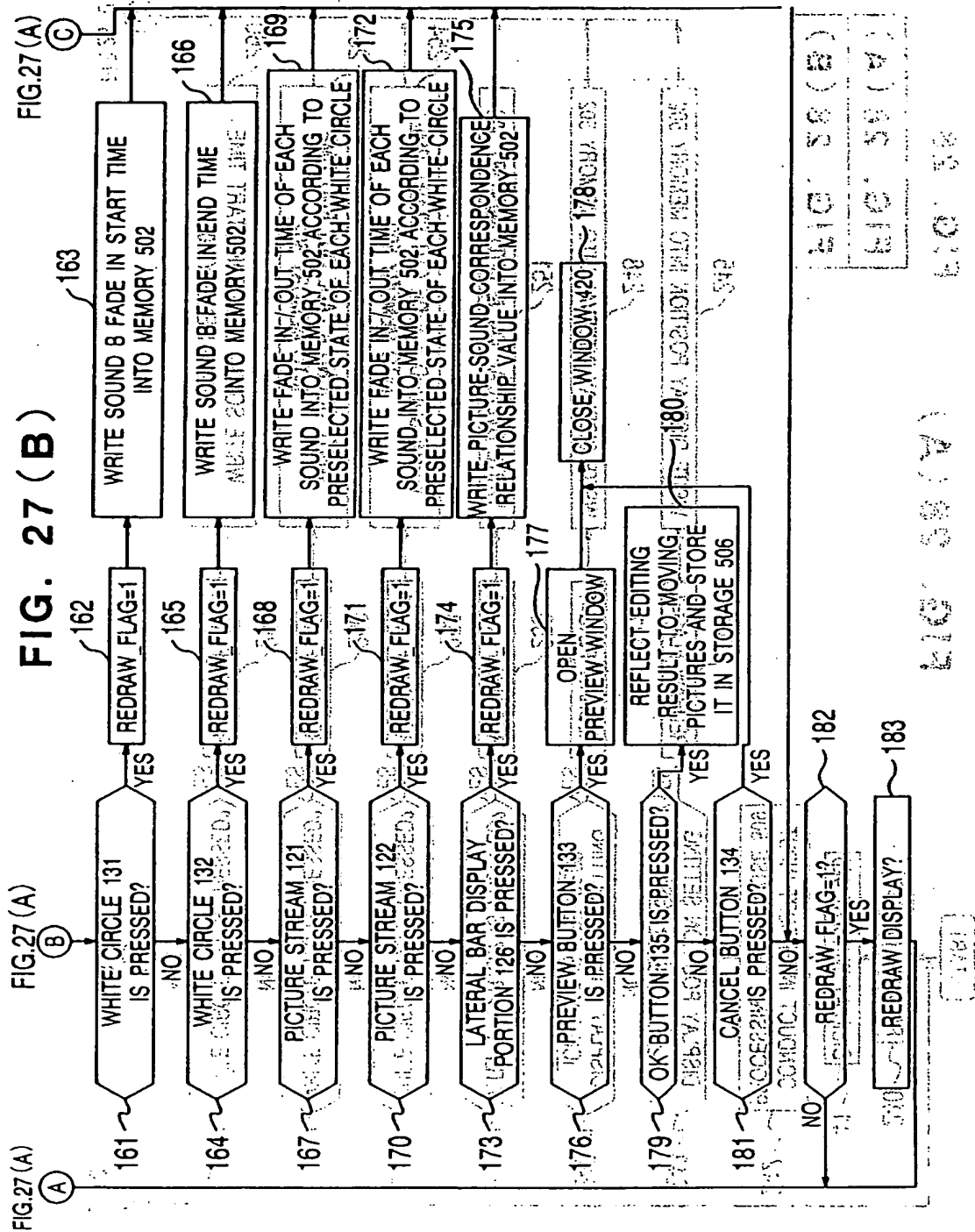


FIG. 25













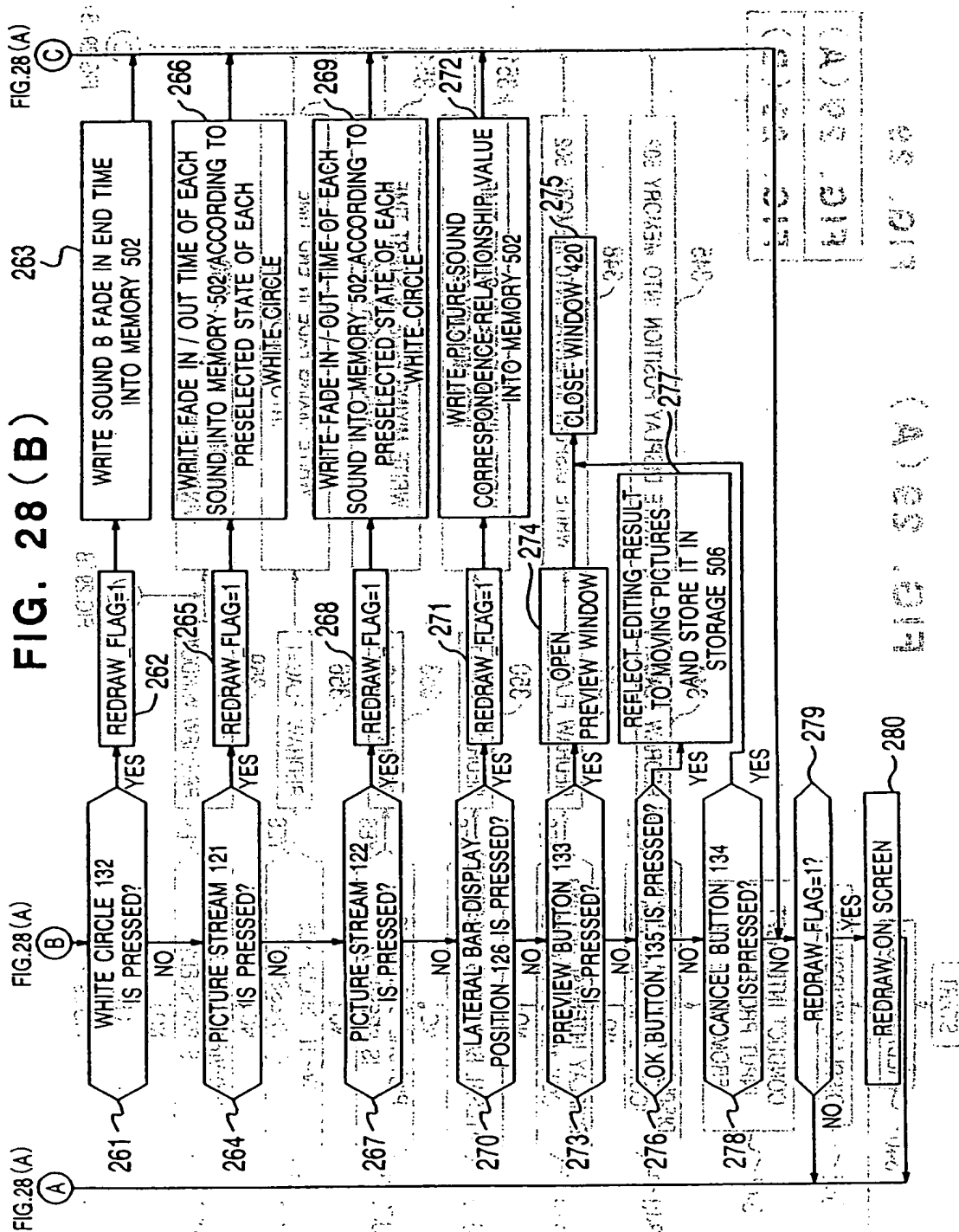


FIG. 29(A)

FIG. 29

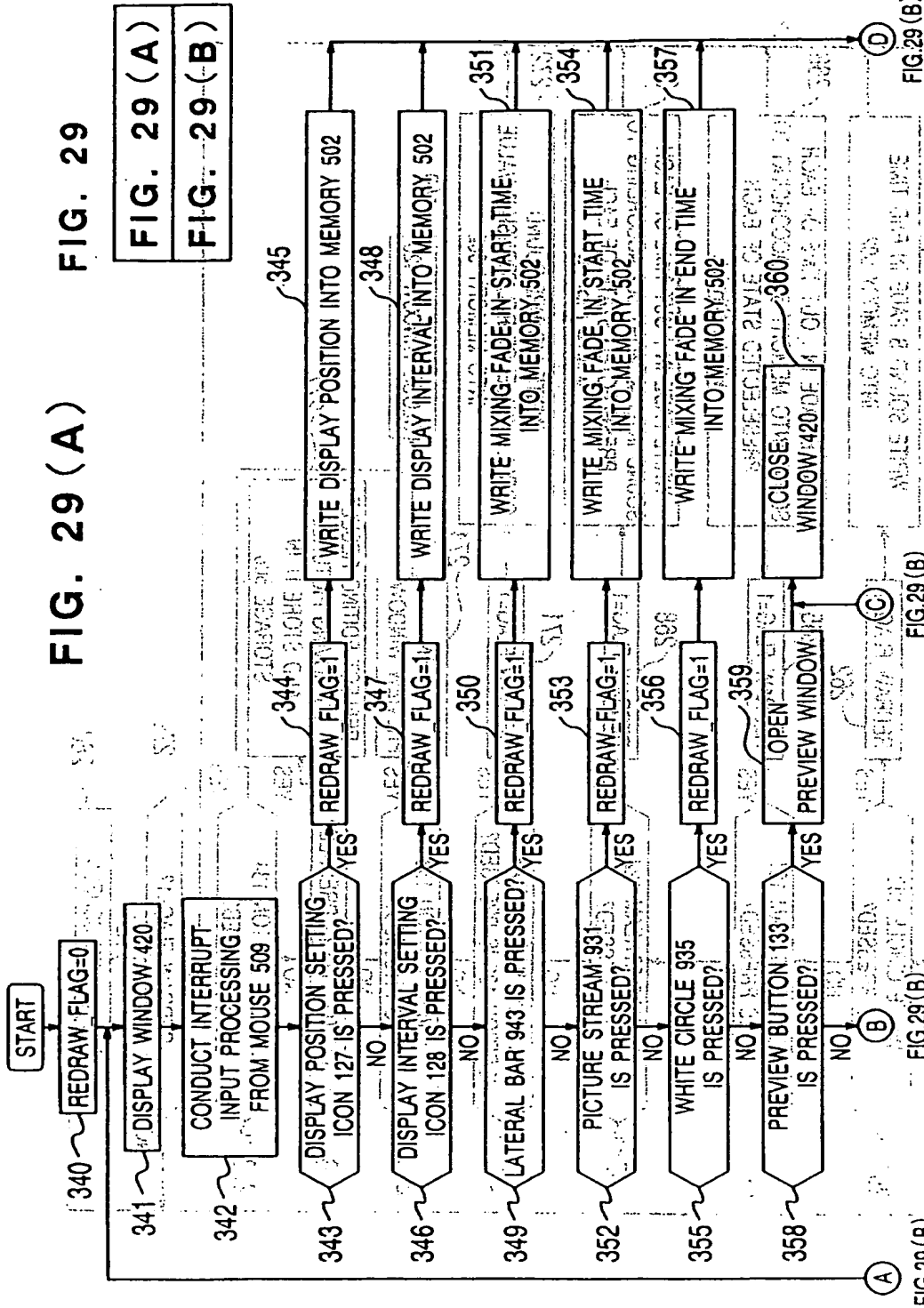


FIG. 29(B)

FIG. 29(B)

FIG. 29(B)

FIG. 29(B)

FIG. 29(B)

FIG. 29(B)

FIG. 29(B)

FIG. 29(B)



(1)

(2)

(3) Date of filing: 1984.04.11

(4) Date of publication: 1984.12.11

(5) Applicant: Hitachi, Ltd.

(6) Date of invention: 1983.12.11

(7) Designated Contracting States: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, NL, PT, SE, SI, UK

(8) Designated Extension States: AL, LT, LV, MK, NO, RO

(9) Filing date: 1984.04.11

(10) Publication date: 1984.12.11

(11) International Class. (IPC): G06F 03/00

FIG. 29 (B)

FIG. 29 (A)

FIG. 29 (A)

FIG. 29 (A)

(A)

(B)

(C)

(D)

REFLECT EDITING RESULT  
TO MOVING PICTURES AND  
STORE IT IN STORAGE 506

361 ~  
CHECK BUTTON 135  
IS PRESSED?

363 ~  
CANCEL BUTTON 134  
IS PRESSED?

364 ~  
REDRAW FLAG=1?

365 ~  
REDRAW ON SCREEN



**(22) Date of filing: 14.11.1997**

**(74) Representative:**  
**Altenburg, Udo, Dipl.-Phys. et al**  
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**Bardhele . Pagenberg . Dost . Altenburg .**  
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**Galileiplatz 1**  
**81679 München (DE)**

EP 0 843 311 A3



European Patent  
Office

TRONEN MONASSE MANIPOLIR BHT OT XENNA  
EUROPEAN SEARCH REPORT  
Application Number  
EP 97 12 0004

DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	1 - Citation of document with indication, where appropriate, of relevant passages	Relevant to claim CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP 0 560 624 A (QUANTEL LTD) 15 September 1993 (1993-09-15) * the whole document *	1-9, 20-22 G11B27/034 G11B27/34 G06F3/033
X	WO 93/07554 A (EASTMAN KODAK CO) 15 April 1993 (1993-04-15) * page 10, line 8 - page 12, line 8; figure 3 *	1-5, 20-22
X	* page 24, line 34 - page 26, line 22 *	24, 25
X	US 5 404 316 A (KLINGLER JOSEPH W ET AL) 4 April 1995 (1995-04-04) * column 8, line 13 - column 9, line 38; figures 6, 17 *	1-7, 20-23 10, 11
A	EP 0 564 247 A (ADOBE SYSTEMS INC) 6 October 1993 (1993-10-06) * column 5, line 39 - column 14, line 53 *	1-5, 10, 11, 20-26
A	US 5 442 744 A (MORRIS TREVOR ET AL) 15 August 1995 (1995-08-15) * the whole document *	1-5, 10, 11, 20-23 TECHNICAL FIELDS SEARCHED (Int.Cl.6) G11B
E	US 5 781 188 A (SHEASBY MICHAEL C ET AL) 14 July 1998 (1998-07-14) * the whole document *	1-26
The present search report has been drawn up for all claims		
Place of search	Date of completion of the search	Examiner
THE HAGUE	1 December 1999	Mourik, J
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# ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 97/12 0004

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on the application. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0560624 A	15-09-1993	GB 2266037 A	13-10-1993
		EP 0858216 A	12-08-1998
		HK 81797 A	27-06-1997
		JP 6121269 A	28-04-1994
		US 5808628 A	15-09-1998
WO 9307554 A	15-04-1993	AU 650179 B	09-06-1994
		AU 2873392 A	03-05-1993
		EP 0560979 A	22-09-1993
		JP 6503695 T	21-04-1994
		US 5982350 A	09-11-1999
US 5404316 A	04-04-1995	AU 4797293 A	03-03-1994
		WO 9403897 A	17-02-1994
		US 5682326 A	28-10-1997
EP 0564247 A	06-10-1993	CA 2093313 A	04-10-1993
		DE 69320516 D	01-10-1998
		DE 69320516 T	24-06-1999
		JP 7046462 A	14-02-1995
US 5442744 A	15-08-1995	JP 6043839 A	18-02-1994
US 5781188 A	14-07-1998	NONE	